Draft
Environmental Impact Report

SCH#2005091117

Volume II
Appendices

Antelope Valley Water Bank Project
(By Western Development and Storage, LLC)

Specific Plan Amendment No. 13, Map 232
Specific Plan Amendment No. 2, Map 233
Alteration of Boundaries of
Agricultural Preserve No. 24 – Inclusion

Kern County
Planning Department
Bakersfield, California

April 2006

Draft
Environmental Impact Report

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Specific Plan Amendment No. 2, Map 233
Alteration of Boundaries of
Agricultural Preserve No. 24 – Inclusion

Prepared by:

Kern County Planning Department
Bakersfield California
Public Services Building
2700 M Street, Suite 100
Bakersfield, CA 93301-2370
Contact: Don Kohler
661/862-8787

Technical Assistance by:

Jones & Stokes
2600 V Street
Sacramento, CA 95818-1914
Contact: Jim James
916/737-3000

April 2006

Appendix A

Notice of Preparation

PLANNING DEPARTMENT

TED JAMES, AICP, Director
2700 "M" STREET, SUITE 100
BAKERSFIELD, CA 93301-2323
hone: (661) 862-8600
FAX: (661) 862-8601 TTY Relay 1-800-735-2929
E-Mail: planning@co.kern.ca.us
Web Address: www.co.kern.ca.us/planning

RESOURCE MANAGEMENT AGENCY

DAVID PRICE III, RMA DIRECTOR
Community & Economic Development Department
Engineering & Survey Services Department
Environmental Health Services Department
Planning Department
Roads Department

NOTICE OF PREPARATION

TO: See Attached Mailing List

DATE: September 21, 2005

FROM: Kern County Planning Department
Attn: Don Kohler
2700 M Street, Suite 100
Bakersfield, CA 93301

SUBJECT: **NOTICE OF PREPARATION OF THE ANTELOPE VALLEY WATER BANK PROJECT ENVIRONMENTAL IMPACT REPORT**

The Kern County Planning Department as Lead Agency (per CEQA Guidelines Section 15052 has required that a Project Environmental Impact Report (per CEQA Guidelines Section 15161) be prepared for the project identified below. The Planning Department solicits the views of your agency as to the scope and content of the environmental information, which is germane to your agency's statutory responsibilities in connection with the proposed project. Your agency will need to use the EIR prepared for our agency when considering your permit or other approval of projects.

Due to the limits mandated by State law, your response must be received by October 20, 2005 at 5pm.

Pursuant to Section 21083.9 of the Public Resources Code a **Scoping Meeting conducted by the Kern County Planning Department to** receive agency comments on the preparation of an Environmental Impact Report **will be held on the following date and at the following location: October 4, 2005 at 1:30 p.m.** at the Kern County Planning Department located at 2700 M Street, Bakersfield, CA.

PROJECT TITLE: Specific Plan Amendment 13, Map 232; Specific Plan Amendment 2, Map 233; Agricultural Preserve No. 24 Inclusion (Antelope Valley Water Bank by Western Development and Storage, LLC) (PP 05283).

PROJECT LOCATION: The Project area is located in an unincorporated area of southern Kern and northern Los Angeles County, T 9N, R 15 W, Section 25 and T 9N, R 14 W, Sections 30 & 31, SBB&M, about 10 miles west of the unincorporated community of Rosamond.

PROJECT DESCRIPTION: The applicant, Western Development and Storage, LLC (WDS) is proposing to construct the Antelope Valley Water Bank Project (Project). The purpose of the Project is to develop a facility to recharge and store imported surface water beneath properties in the west end of the Antelope Valley, California. The area proposed for recharge and recovery facilities is zoned A (Exclusive Agriculture), E (Estate), and A FPS (Exclusive Agriculture; Flood Plain Secondary) Districts, but also includes approximately 640 acres of residential and industrial designations under the Willow Springs Specific Plan.

Date: September 21, 2005

Signature:
Name: Don Kohler
Title: Planner 1
Telephone: (661) 862-8787
KohlerD@co.kern.ca.us

Attachments

EIR 3-05
PP05283
9/13/05 pd

City of Arvin
P.O. Box 548
Arvin, CA 93203

City of Bakersfield
Planning Department
1715 Chester Avenue
Bakersfield, CA 93301

California City Planning
21000 Hacienda Boulevard
California City, CA 93515

City of Delano
P.O. Box 939
Delano, CA 93216

City of Maricopa
P.O. Box 548
Maricopa, CA 93252

City of McFarland
P.O. Box 1488
McFarland, CA 93250

City of Ridgecrest
100 West California Avenue
Ridgecrest, CA 93555

City of Shafter
336 Pacific Avenue
Shafter, CA 93263

City of Taft
Planning and Building
209 East Kern Street
Taft, CA 93268

City of Tehachapi
115 South Robinson Street
Tehachapi, CA 93561-1722

City of Wasco
P.O. Box 190
Wasco, CA 93280

Inyo County Planning Department
P.O. Drawer "L"
Independence, CA 93526

Kings County Planning Agency
Kings County Government Building #6
1400 West Lacey Boulevard
Hanford, CA 93230

Los Angeles County
Department of Regional Planning
320 West Temple Street, Room 1390
Los Angeles, CA 90012

San Bernardino County
Office of Planning
385 North Arrowhead Avenue, 3rd Floor
San Bernardino, CA 92415

San Luis Obispo County
Planning and Building Department
County Government Center
San Luis Obispo, CA 93408

Santa Barbara County
Planning and Development
123 East Anapamu Street
Santa Barbara, CA 93101

Tulare County Planning & Development Dept.
Room 105-111
County Civic Center
Visalia, CA 93291-4503

Ventura County Planning Department
Attention Victor R. Husbands, Director
800 South Victoria Avenue
Ventura, CA 93009

U.S. Department of Interior/BLM
Ridgecrest Field Office
300 South Richmond Road
Ridgecrest, CA 93555

China Lake Naval Weapons Center
Commanding Officer Code (832120D)
Real Estate/Mail Stop 4003
China Lake, CA 93555-6108

Edwards Air Force Base
AFFTC/XRX Bldg 0001, Rm 110
#1 South Rosamond Boulevard
Edwards AFB, CA 93524-1936

U. S. Fish & Wildlife Service
San Joaquin Valley Branch Chief
2800 Cottage Way #W-2605
Sacramento, CA 95825-1846

U.S. Forest Service
Los Padres National Forest
6755 Hollister Avenue, Suite 150
Goleta, CA 93117

Eastern Kern Resource
Conservation District
P.O. Box 626
Inyokern, CA 93527

Kern County Agriculture Department

Joaquin Valley Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, CA 93726

Community Development

Kern County Administrative Officer

Kern County Engineering & Survey Svs/
Floodplain

Kern County Engineering & Survey Svs/
Survey

Kern County Env Health Services Department

Kern County Fire Department

Kern County Library
Beale

Kern County Museum

Kern County Parks and Recreation

Resource Management Agency
Special Projects/Fiscal Analysis

Kern County Sheriff's Department

Kern County Roads Department

Kern County Waste Management Department

Southern Kern Unified School District
P.O. Box CC
Rosamond, CA 93560

Kern County Superintendent of Schools
Attention Schifra Walder
1300 - 17th Street
Bakersfield, CA 93301

KernCOG

Local Agency Formation Commission
5300 Lennox Avenue, Suite 303
Bakersfield, CA 93309

Rosamond Community Services Dist.
3179 - 35th Street West
Rosamond, CA 93560

Kern County Water Agency
P.O. Box 58
Bakersfield, CA 93302-0058

City of Bakersfield
Parks & Recreation Dept.
4101 Truxtun Avenue
Bakersfield, CA 93301

Golden Empire Transit
1830 Golden State Avenue
Bakersfield, CA 93301

Kern Mosquito Abatement District
4705 Allen Road
Bakersfield, CA 93312-3429

Rosamond Disposal
1731 Sierra Highway
Rosamond, CA 93560

Desert Tortoise Preserve Committee
4067 Mission Inn Avenue
Riverside, CA 92501

Native American Heritage Council
of Kern County
P.O. Box 1507
Bakersfield, CA 93302

SBC California
Attention Cindy Lee
1250 East Ashlan Avenue
Fresno, CA 93704

Sierra Club/Kern Keaweah Chapter
Arthur Unger

******PUT IN BUCKET *****

Southern California Edison
Planning Department
421 West "J" Street
Tehachapi, CA 93561

Southern California Gas Company
1510 North Chester Avenue
Bakersfield, CA 93308

hern California Gas Co.
Attention Trans. Dept.
9400 Oakdale Avenue
Chatsworth, CA 91313-6511

Smart Growth Coalition
441 Vineland Road
Bakersfield, CA 93307

Mary Ann Lockhart
P.O. Box GG
Frazier Park, CA 93225

Mountain Community Town Council, Inc
P O Box 178
F...zier Park, CA 93225

Caltrans Permit Engineer
Ray Chopra
1226 Olive Drive
Bakersfield, CA 93308

Cuddy Valley Statistcal Consulting
11667 Steinhoff Road
Frazier Park, CA 93222

Southern San Joaquin Valley
Archaeological Information Center/CSUB
9001 Stockdale Highway
Bakersfield, CA 93311

Caltrans District 6
Planning/Land Bank Bldg.
P.O. Box 12616
Fresno, CA 93778

State Clearinghouse/Office of Planning and Research
P.O. Box 3044
Sacramento, CA 95812-3044

CERTIFIED MAIL

Department of Conservation/Division of
Oil, Gas, & Geothermal Resources
4800 Stockdale Highway, Suite 417
Bakersfield, CA 93309

State Fish and Game
1130 East Shaw, Suite 206
Fresno, CA 93710

California Regional Water Quality
Control Board/Central Valley Region
1685 E Street
Fresno, CA 93706-2020

Department of Water Resources
San Joaquin District
3374 East Shields Avenue, Rm A-7
Fresno, CA 93726

Aerial Acres Water System
P.O. Box 1112
North Edwards, CA 93523

Airway Mutual Water Company
PO Box 451
Rosamond, CA 93560

Antelope Mutual Water Company
Lake Hughes, CA 93532

Antelope Park Mutual Water Company
PO Box 1712
43337 N. 18th Street West
Lancaster, CA 93539

Antelope Valley-East Kern Water Agency
6500 West Avenue N
Palmdale, CA 93551

Antelope Valley Progressive Club
810 East 84th Street
Los Angeles, CA 90001

Antelope Valley United Water Purveyors
Jim Barletta, President
3507 E. Avenue H-4
Lancaster, CA 93535

Aqua J. Mutual Water Company
44740 V. 91st Street East
Lancaster, CA 93534

Aqua J. Water company
9133 East Avenue J
Lancaster, CA 93539

Averydale Mutual Water Company
3507 East Avenue H-10
Lancaster, CA 93534

Association of Irrigation Water Users
Jim Payne
3721 Knox Avenue
Rosamond, CA 93560-6410

Baxter Mutual Water Company
12501 East Avenue H
Lancaster, CA 93535

Big Rock Mutual WaterCompany
Route 1, Box 25
Llano, CA 93536

Belch Flat Mutual Water Company
46201 Kings Canyon Road
Lancaster, CA 93536

Boron Community Service Dist.
Russ Terrill
P.O. Drawer B
Boron, CA 93516

ornia Water Service Company
5015 West Avenue L-14, Ste 2
Quartz Hill, CA 93536

California City Planning Dept.
21000 Hacienda Blvd.
California City, CA 93515

Colorado Mutual Water Company
43841 N. 90th Street East
Lancaster, CA 93535

Crestmore Village Water Company
42975 Staffordshire Drive
[illegible]aster, CA 93534

Crestmore Water Association
Paul Brinson
39839 - 9th Street East
Palmdale, CA 93550

Desert Lake Community Services District
PO Box 567
Boron, CA 93596

Edgemont Acres Water Company
P.O. Box 966
North Edwards, CA 93523

Edwards Air Force Base
95 CEG/CERF
225 N. Rosamond Blvd., Bldg 3500
Edwards AFB, CA 93524-8540

Edwards Air Force Base
95 CEG/CERF/Propulsion Lab Water
225 N. Rosamond Blvd., Bldg 3500
Edwards AFB, CA 93524-8540

El Dorado Mutual Water Company
PO Box 900519
Palmdale, CA 93590

Evergreen Mutual Water Company
5347 East Avenue I
Lancaster, CA 93534

40th Street Mutual Water Company
43031 N. 40th Street East
Lancaster, CA 93534

Golden Valley Municipal Water District
Caravann Inn
Gorman, CA 93536

Green Grove Mutual Water Company
3157 East Avenue I
Lancaster, CA 93534

Green Valley County Water District
39520 Calle Casada
Green Valley, CA 91350

J. L. Ralphs Water Company
49744 Gorman Post Road
Gorman, CA 93536

Lake Elizabeth Mutual Water Company
14960 Elizabeth Lake Road
Lake Elizabeth, CA 93532

Lancaster Mutual Water Company
44714 West 20th Street
Lancaster, CA 93536

Lancaster Mutual Water Company
PO Box 25
54654 N. 20th Street East
Lancaster, CA 93534

Land of Promise Water Company
Ellen Baron
HCR #1, Box 104A
Rosamond, CA 93560

Land Projects Mutual Water Company
8810 West Avenue E-8
Antelope Acres, CA 93536

Landale Mutual Water Company
PO Box 5808
Lancaster, CA 93539

Land Projects Mutual Water Company
c/o Mr. Nash
212 W. Avenue K
Lancaster, CA 93534

Little Baldy Water Company
PO Box 7
30716 Largo Vista Lane
Llano, CA 93544

Littlerock Creek Irrigation District
35141 East 87th Street
PO Box 128
Littlerock, CA 93543

Llano Del Rio Water Company
32810 S. 165th Street East
Llano, CA 93544

Llano Falls Mutual Water Company
PO Box 1-F
Llano, CA 93544

Llano Mutual Water Company
Route 1, Box 25
32810 South 165th Street East
Llano, CA 93544

L.A. County Water Works District
PO Box 1460
Alhambra, CA 91802-1460

L.A. County Water Works District
260 E. Avenue K-8
Lancaster, CA 93535

[illegible] ve Public Utility Dist.
15844 "K" Street
Mojave, CA 93501

North Edwards Water Dist.
13005 Claymine Road
P.O. Box 1147
North Edwards, CA 93523

Old Timers Mutual Water Company
8757 East Avenue J
Lancaster, CA 93534

Palm Ranch Irrigation District
PO Box 3396
tz Hill, CA 93586-0396

Palmdale Water District
Dennis LaMoreaux
2029 East Avenue Q
Palmdale, CA 93550

Quartz Hill Water District
PO Box 3218
Quartz Hill, CA 93586

Reesdale Mutual Water Company
PO Box 496
Lancaster, CA 93534

Rosamond Community Services Dist.
PO Box H
3179 - 35th Street West
Rosamond, CA 93560

Showdow Acres Mutual Water Company
PO Box 900669
Palmdale, CA 93590

16th Street East Tract Company
44601 N. 16t Street East
Lancaster, CA 93535

Sleepy Valley Water Company
14220 Sierra Highway
Mint Canyon, CA 91390

Spring Valley Ranch Tract Water Company
43164 Lake Hughes Road
Lake Hughes, CA 93532

Sundale Mutual Water Company
PO Box 551
Lancaster, CA 93535

Sunnyside Farms Mutual Water Company
PO Box 901025
Palmdale, CA 93590

Tehachapi-Cummings County Water Dist.
Robert Jaspar, General Manager
P.O. Box 326
Tehachapi, CA 93561

Tierra Bonita Mutual Water Company
5606 East Avenue K
Lancaster, CA 93535

Tweedy Lake Corporation
24303 West Pine Canyon Road
Lake Hughes, CA 93532

Valencia Water Company
24631 Avenue Rockefeller
Valencia, CA 91355

W & S Mutual Water Company
1055 El Medio
Pacific Palisades, CA 90272

West Valley County Water District
25315 Ideal Avenue
Lancaster, CA 93536

Westside Park Mutual Water Company
1216 West Avenue J, Ste 500
Lancaster, CA 93534

White Fence Farms Mutual Water Co., #1 & #2
41901 N. 20th Street West
Plamdale, CA 93551

White Fence Farms Mutual Water Co., #3
2606 West Avenue N-8
Palmdale, CA 93551

Wilsona Garden Mutual Water Company
17135 East Avenue L
PO Box 85
Lancaster, CA 93535

Grimmway Farms
David Rizzo
PO Box 893
Lancaster, CA 93535

Los Angeles Dept. of Water & Power
PO Box 51111
Los Angeles, CA 90051-0100

Antelope Valley Chapter BIA
104 East Avenue K-4, Ste B
Lancaster, CA 93535

Los Angeles Dept. of Water & Power
Environmental Affairs
111 North Hope Street, Rm 1044
Los Angeles, CA 90012

Los Angeles Department of Public Works
900 S. Fremont Avenue
Alhambra, CA 91803

Los Angeles County Regional Planning Dept.
Hall of Records (13th Floor)
320 West Temple Street
Los Angeles, CA 90012

of Lancaster Public Works
44933 N. Fern Avenue
Lancaster, CA 93534

City of Lancaster Planning Department
44933 N. Fern Avenue
Lancaster, CA 93534

City of Palmdale Public Works
38250 Sierra Highway
Palmdale, CA 93550

City of Palmdale Planning Department
38250 Sierra Highway
Palmdale, CA 93550

Judith Fuentes
47458 - 92nd Street West
Antelope Acres, CA 93536

Forecast Land Company
PO Box 5553
Sherman Oaks, CA 91413

Dave Pettijohn
111 N. Hope Street, Room 1461
Los Angeles, CA 90064

Dept. of Water Resources/Div of Land & Right of Way - Conny Anderson
PO Box 942836
Sacramento, CA 94236

Los Angeles CountyWater Works District
900 South Fremont
Alhambra, CA 91803

Los Angeles County Farm Bureau
Kathleen Burr
41228 - 12th Street West, Ste A
Palmdale, CA 93551

AV Building Industry Association
Gretchen Gutierrez
104 E. Avenue K-4, Ste B
Lancaster, CA 93535

Kern County Farm Bureau
801 South Mt. Vernon Avenue
Bakersfield, CA 93307

Tejon Ranch
Dennis Mullins
P.O. Box 1000
Lebec, CA 93243

R. L. Abott & Associates
5060 California Avenue, Ste 910
Bakersfield, CA 93309

Santa Rosa Rancheria
Clarence Atwell
P.O. Box 8
Lemoore, CA 93245

Tule River Indian Tribe
Neil Peyron
P.O. Box 589
Porterville, CA 93258

Tejon Indian Tribe
Kathy Morgan
2234 - 4th Street
Wasco, CA 93280

Form A

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, PO Box 3044, Sacramento, CA 95812-3044 916/445-0613

SCH # ____________

Project Title: Antelope Valley Water Bank Project by Western Development and Storage

Lead Agency: Kern County Planning Department — Contact Person: Don Kohler

Mailing Address: 2700 M Street, Suite 100 — Phone: (661) 862-8787

City: Bakersfield — Zip: 93301 — County: Kern

Project Location:

County: Kern — City/Nearest Community: Rosamond

Cross Streets: Avenue "A" and 170th Street West — Zip Code: 93560 — Total Acres: 13,440

Assessor's Parcel No. 359-04-01, 11, 12, 17, 18 — Section: 25 / 30&31 — Twp. 9N — Range: 15W/ 14W — Base: SBB&M

Within 2 Miles: State Hwy #: ____ Waterways: ____

Airports: ____ Railways: ____ Schools: ____

Document Type:

CEQA:
- ☐ NOP
- ☐ Early Cons
- ☐ Neg Dec
- ☒ Draft EIR
- ☐ Supplement/Subsequent EIR (Prior SCH No.) ____
- ☐ Other ____

NEPA:
- ☐ NOI
- ☐ EA
- ☐ Draft EIS
- ☐ FONSI

Other:
- ☐ Joint Document
- ☐ Final Document
- ☐ Other ____

Local Action Type:

- ☐ General Plan Update
- ☐ General Plan Amendment
- ☐ General Plan Element
- ☐ Community Plan
- ☒ Specific Plan
- ☐ Master Plan
- ☐ Planned Unit Development
- ☐ Site Plan
- ☐ Rezone
- ☐ Prezone
- ☐ Use Permit
- ☐ Land Division (Subdivision, etc.)
- ☐ Annexation
- ☐ Redevelopment
- ☐ Coastal Permit
- ☐ Other ____

Development Type:

- ☐ Residential: *Units* ____ *Acres* ____
- ☐ Office: *Sq.ft.* ____ *Acres* ____ *Employees* ____
- ☐ Commercial: *Sq.ft.* ____ *Acres* ____ *Employees* ____
- ☐ Industrial: *Sq.ft.* ____ *Acres* ____ *Employees* ____
- ☐ Educational ____
- ☐ Recreational ____
- ☒ Water Facilities: *Type* Water Bank *MGD* ____
- ☐ Transportation: *Type* ____
- ☐ Mining: *Mineral* ____
- ☐ Power: *Type* ____ *Watts* ____
- ☐ Waste Treatment: *Type* ____
- ☐ Hazardous Waste: *Type* ____
- ☐ Other: ____

Funding (approx.): Federal $____ State $____ Total $____

Project Issues Discussed in Document:

- ☒ Aesthetic/Visual
- ☒ Agricultural Land
- ☒ Air Quality
- ☒ Archeological/Historical
- ☐ Coastal Zone
- ☒ Drainage/Absorption
- ☐ Economic/Jobs
- ☐ Fiscal
- ☒ Flood Plain/Flooding
- ☐ Forest Land/Fire Hazard
- ☒ Geologic/Seismic
- ☐ Minerals
- ☒ Noise
- ☐ Population/Housing Balance
- ☐ Public Services/Facilities
- ☐ Recreation/Parks
- ☐ Schools/Universities
- ☐ Septic Systems
- ☐ Sewer Capacity
- ☒ Soil Erosion/Compaction/Grading
- ☐ Solid Waste
- ☐ Toxic/Hazardous
- ☒ Traffic/Circulation
- ☒ Vegetation
- ☒ Water Quality
- ☐ Water Supply/Groundwater
- ☐ Wetland/Riparian
- ☐ Wildlife
- ☒ Growth Inducing
- ☒ Landuse
- ☒ Cumulative Effects
- ☐ Other ____

Present Land Use/Zoning/General Plan Designation: AGRICULTURAL & VACANT LAND / A (EXCLUSIVE AG); E (ESTATE) + FPS (FLOOD PLAIN SECONDARY) / 8.5 (RESOURCE MGMT); 7.1 (LIGHT INDUSTRIAL); 5.3 (RESIDENTIAL); 4.4 (COMPREHENSIVE PLAN AREA); 2.85 (MILITARY FLIGHT OPS) 2.6 (FLOOD HAZARD)

Project Description:

The applicant, Western Development and Storage, LLC (WDS) is proposing to construct the Antelope Valley Water Bank Project (Project). The purpose of the Project is to develop a facility to recharge and store imported surface water beneath properties in the west end of the Antelope Valley, California.

Reviewing Agencies Checklist

Form A, continued

KEY
S = Document sent by lead agency
X = Document sent by SCH
✓ = Suggested distribution

_____ **Resources Agency**
_____ Boating & Waterways
_____ Coastal Commission
_____ Coastal Conservancy
_____ Colorado River Board
_____ Conservation
S Fish & Game
_____ Forestry & Fire Protection
_____ Office of Historic Preservation
_____ Parks & Recreation
_____ Reclamation Board
_____ S.F. Bay Conservation & Development Commission
_____ Water Resources (DWR)

Business, Transportation & Housing
_____ Aeronautics
_____ California Highway Patrol
S CALTRANS District # 6
_____ Department of Transportation Planning (headquarters)
_____ Housing & Community Development

_____ **Food & Agriculture**

Health & Welfare
_____ Health Services _____

State & Consumer Services
_____ General Services
_____ OLA (Schools)

Environmental Protection Agency
_____ Air Resources Board
_____ California Waste Management Board
_____ SWRCB: Clean Water Grants
_____ SWRCB: Delta Unit
_____ SWRCB: Water Quality
_____ SWRCB: Water Rights
_____ Regional WQCB #_____ (_____)

Youth & Adult Corrections
_____ Corrections

Independent Commissions & Offices
_____ Energy Commission
_____ Native American Heritage Commission
_____ Public Utilities Commission
_____ Santa Monica Mountains Conservancy
_____ State Lands Commission
_____ Tahoe Regional Planning Agency

_____ Other _____

Public Review Period (to be filled in by lead agency)

Starting Date September 21, 2005 Ending Date October 20, 2005

Signature [signature] Date September 21, 2005

Lead Agency (Complete if applicable):
Consulting Firm: _____
Address: _____
City/State/Zip: _____
Contact: _____
Phone: (____) _____

Applicant: _____
Address: _____
City/State/Zip: _____
Phone: (____) _____

For SCH Use Only:
Date Received at SCH _____
Date Review Starts _____
Date to Agencies _____
Date to SCH _____
Clearance Date _____
Notes:

Notice of Preparation
for the
Antelope Valley Water Bank Project

Specific Plan Amendment No. 13, Map 232
Specific Plan Amendment No. 2, Map 233
Alteration of Boundaries of Agricultural Preserve No. 24 – Inclusion

(By Western Development and Storage, LLC)

Kern County Planning Department
2700 M Street, Suite 100
Bakersfield, CA 93301
Contact: Don Kohler
661/862-8787

Technical Assistance by:

Jones & Stokes
2600 V Street
Sacramento, CA 95818-1914
Contact: Jim James
916/737-3000

Acronyms and Abbreviations

af	acre-feet
AVAQMD	Antelope Valley Air Quality Management District
AVEK	Antelope Valley East Kern Water Agency
bgs	below ground surface
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CO	carbon monoxide
DHS	California Department of Health Services
DWR	Department of Water Resources
FMMP	Farmland Mapping and Monitoring Program
KCAPCD	Kern County Air Pollution Control District
LAA#2	Los Angeles Aqueduct #2
LADWP	Los Angeles Department of Water and Power
LOS	Level of Service
NOx	nitrogen oxides
NOP	Notice of Preparation
Planning Department	Kern County Planning Department
PM10	Particulate Matter
Project	Antelope Valley Water Bank Project
ROG	Reactive Organic Gases
RWQCB	Lahonton Regional Water Quality Control Board
SWP	State Water Project
TSS	total suspended sediments
WDS	Western Development and Storage, LLC
WSSP	Willow Springs Specific Plan

Chapter 1
Project Description

1.1 Introduction

The applicant, Western Development and Storage, LLC (WDS) is proposing to construct the Antelope Valley Water Bank Project (Project). The purpose of the Project is to develop a facility to recharge and store imported surface water beneath properties in the west end of the Antelope Valley, California (Figure 1-1). The area proposed for recharge and recovery facilities is zoned as A (Exclusive Agriculture), E (Estate), and FPS (Flood Plain Secondary) Districts but also includes approximately 640 acres of residential and industrial designations under the Willow Springs Specific Plan. Implementation of the project will require:

- amendment of the Willow Springs Specific Plan to change various map code designations;
- inclusion of approximately 640 acres into Agricultural Preserve No. 24;
- construction of wells and facilities and accessory structures needed for ongoing maintenance and operation necessary to transport water; and
- authorization and permits from various affected agencies.

Under the Project, water would be imported from the State Water Project (SWP) via the East Branch of the California Aqueduct (Figure 1-1). When needed, stored water would be recovered for delivery to various municipal water agencies, such as those in Kern, Los Angeles, and Orange Counties. A committee comprised of local and other interested representatives would be established to monitor the impacts of recharge, storage, and recovery operations.

This chapter describes the Project. Chapter 2 presents a completed Environmental Checklist Form for the Project. References cited in this document are listed in Chapter 3.

1.2 Project Objectives

The applicant has stated the primary purpose of the Project is to provide additional water storage to supply the needs of Antelope Valley and, potentially, other regions of southern California, through facilities that are of sufficient size and scope to be both cost-effective and environmentally sound. WDS conducted an assessment of water storage needs and constraints and identified western Antelope Valley as having suitable geographic and geologic features for such a project.

WDS intends to either transfer the Antelope Valley Water Bank to a public agency or agencies, or partner with such agencies and potentially other water suppliers, wholesalers, and retailers to develop and/or operate the Antelope Valley Water Bank. In general, imported SWP water would be recharged during wet years and recovered when needed.

The Project is designed to:

- enhance water supply reliability and flexibility in a cost effective and environmentally sound manner;
- reduce groundwater overdraft; and
- encourage conjunctive use, where appropriate.

Important characteristics of the Project are summarized in Table 1-1.

Table 1-1. Important Characteristics of the Project

Item	Project
Objectives	Enhance water supply reliability and flexibility through a facility that is of sufficient size and scope to be both cost effective and environmentally sound; reduce groundwater overdraft; and encourage conjunctive use, where appropriate
Source of recharge water	State Water Project
Recharge basin area	Approximately 1,200–1,500 acres
Total capacity	500,000 acre feet ("af") of total storage capacity
Annual capacity	100,000 af
Instantaneous recharge capacity	Approximately 350 cfs
Instantaneous recovery capacity	Approximately 250 cfs
Wells for recovery of stored surface water	Approximately 30 to 40 new wells Use of existing wells as appropriate
Project participants	Municipal water agencies, such as those in Kern, Los Angeles, and Orange Counties
Overdraft recovery	10% of recharged water left behind for overdraft recovery
Monitoring committee	Impacts on groundwater levels and water quality, would be monitored by a committee, which may include, among others, representatives from the owner/operator, neighboring land owners, Rosamond Community Service District, and Antelope Valley State Water Project Contractors Association (a joint powers authority including the Antelope Valley East Kern Water Agency, Palmdale Water District, and Littlerock Creek Irrigation District).

Notes:

af = acre-feet.

cfs = cubic feet per second.

1.3 Project Location and Setting

The Project area is located in an unincorporated area of southern Kern and northern Los Angeles County, about 10 miles west of the unincorporated community of Rosamond (Figure 1-1). Avenue A , the county line between Kern County and Los Angeles County, lies immediately south of the area proposed for the recharge and recovery facilities (Figure 1-2).

1.3.1 Regional Setting

Antelope Valley is situated near the western edge of the Mojave Desert and is defined by the Tehachapi Mountains to the northwest and the San Gabriel Mountains to the southwest (Figure 1-1). The valley floor sits at an elevation of

approximately 2,600 feet above mean sea level and slopes gently from northwest to southeast. The climate is semiarid, and the area receives less than 10 inches of rainfall annually. There are no nearby perennial waters.

The basin of the valley is underlain by several thousand feet of alluvial deposits that eroded from adjacent mountain ranges. The recharge and recovery facilities would be located in the Neenach Subbasin, one of 12 subbasins in the valley (Figure 1-3). Near-surface soils are sand and gravel. Deeper deposits are sand with some gravel, silt, and clay. Several fault zones that define the Neenach Subbasin appear to restrict the movement of the groundwater between subbasins (Figure 1-3).

Development in Antelope Valley began in the 1870s when the Southern Pacific Railroad completed a rail line providing passage from Los Angeles to San Francisco. Edwards Air Force Base, located about 15 miles east of the Project site, was built in the 1930s and remains in use. Today, the defense and aerospace industries are major employers. The cities of Palmdale and Lancaster are located in Los Angeles County and are the largest cities in Antelope Valley (Figure 1-1). These two cities have grown dramatically since the 1980s, and their populations are estimated to exceed 150,000 each.

Historically, the groundwater table in Antelope Valley was 20–150 feet below ground surface (bgs). The advent of gasoline-powered groundwater pumps in the early 1900s allowed for the expansion of agriculture in the valley, with alfalfa being the principal crop. By the mid-1960s, the water table had dropped to more than 300 feet bgs. With the availability of SWP water in the 1970s, farmers began to rely on imported surface water as well as groundwater for irrigation, and the water table has since stabilized at about 340 feet bgs. The groundwater beneath the Project site is considered high quality, with no analytes exceeding either state or federal drinking water criteria.

1.3.2 Local Setting

The area proposed for recharge and recovery facilities is bounded by:

- Rosamond Avenue to the north,
- Avenue A to the south (Kern County–Los Angeles County line),
- 170^{th} Street West to the west, and
- 100^{th} Street West to the east (Figure 1-2).

Recharge and recovery facilities include a distribution pipeline, recharge basins, recovery wells, and recovery pipelines. The land in the recharge and recovery facilities area is made up of farmland and undeveloped land. The recharge and recovery facilities would be located within a 21-square-mile area (13,440 acres), with the recharge basins occupying 1,200–1,500 of these acres within the 1,920-acre recharge basin area. The remainder of the 21-square-mile area would not be disturbed, except for the pipeline alignments and wellhead areas. The parcels

within the areas proposed for recharge are zoned as A (Exclusive Agriculture) (Figure 1-4). The Kern County Zoning Ordinance states that the purpose of the Exclusive Agriculture Zoning District is to designate areas suitable for agricultural uses and to prevent the encroachment of incompatible uses onto agricultural lands and the premature conversion of such lands to nonagricultural uses. Uses in the Exclusive Agriculture Zoning District are limited primarily to agricultural uses and other activities compatible with agricultural uses.

The Kern County Zoning Ordinance also defines a set of combining zoning districts that can be applied to a parcel in conjunction with its base zoning district. For example, a parcel zoned as Exclusive Agriculture (A) can also be zoned as Flood Plain Secondary (FPS) if it is subject to relatively frequent, low-velocity flooding. A number of parcels in the Project area are zoned in this manner. The FPS combining zoning district allows all the uses permitted by the base zoning district but may apply additional prohibited uses in the interest of protecting public health and safety and minimizing property damage caused by flooding. The Project uses would be consistent with this zoning. The properties proposed for the recharge basins also are designated as Prime Farmland and have been farmed since at least the 1960s. Two of the properties are subject to existing Williamson Act contracts.

The area proposed for recharge and recovery facilities is located within the service area of the Antelope Valley East Kern Water Agency (AVEK). Irrigation water is provided by local groundwater wells and imported SWP water via the AVEK West Feeder (Figures 1-1 and 1-2).

If needed, WDS would construct a 7-mile-long pipeline to deliver water to and from the California Aqueduct. The new delivery pipeline would be aligned parallel to an existing pipeline (Los Angeles Aqueduct #2 [LAA#2]), which passes just west of the area proposed for recharge basins and runs through Los Angeles County (Figure 1-2). The optional proposed delivery pipeline would run south from the recharge and recovery facilities area, along 170th Street, until it intersects the California Aqueduct, a distance of approximately 7 miles (Figure 1-1). The land along the proposed pipeline alignment is predominately agricultural or not developed.

1.4 Proposed Discretionary Actions

As part of the proposed project, the applicant is requesting approval of an amendment to the Willow Springs Specific Plan and an inclusion for the agricultural preserve. Each of these requests is described below.

1.4.1 Specific Plan Amendment

Land uses allowed in the project site are established and guided by the Land Use Element of the Willow Springs Specific Plan. This document controls the type, intensity, and distribution of land uses in a 79-square mile area in the eastern area

of the Kern County General Plan. The Willow Springs Specific Plan was adopted in 1992 and identified a mix of residential, industrial and resource management uses for the area combined with designations identifying constraints due to military flight corridors, flood and comprehensive planning requirements (Figure 1-4). This project will amend the Willow Springs Specific Plan as follows (Figure 1-5):

- Map Codes 8.5/2.85 (Resource Management—minimum 20 or 80-acre parcel size; Military Flight Operations (60 dB)) to 8.1/2.85 (Intensive Agriculture—minimum 20-acre parcel size; Military Flight Operations (60 dB)) on approximately 300 acres.
- Map Codes 8.5/2.85/2.6 (Resource Management—minimum 20 or 80-acre parcel size; Military Flight Operations (60 dB); Flood Hazard) to 8.1/2.85/2.6 (Intensive Agriculture—minimum 20-acre parcel size/Military Flight Operations (60 dB; Flood Hazard) on approximately 50 acres.
- Map Codes 5.3/4.4/2.85 (Residential—maximum 10 units per net acre; Comprehensive Plan Area; Military Flight Operations (60 dB)) to 8.1/4.4/2.85 (Intensive Agriculture—minimum 20-acre parcel size; Comprehensive Plan Area; Military Flight Operations (60 dB)) on approximately 320 acres.
- Map Codes 7.1/4.4 (Light Industrial; Comprehensive Plan Area) to 8.1/4.4 (Intensive Agriculture—minimum 20-acre parcel size; Comprehensive Plan Area) on approximately 320 acres.

The parcels proposed for recharge basins are currently zoned as A (Exclusive Agriculture) and A FPS (Flood Plain Secondary Combining) Districts which are consistent with the proposed designations. Although the broader recharge and recovery area includes parcels zoned Estate, WDS shall constrain development of recovery wells to parcels that are zoned A (Figure 1-6). The recharge and recovery components planned for the facility area are an allowable use in the A zone district.

1.4.2 Agricultural Preserve Inclusion

The proposed land use designation change from residential and industrial to A (Exclusive Agriculture) within the existing A zoning requires an alteration of the boundaries of Agricultural Preserve No. 24 to include approximately 640 acres. Agricultural Preserves have been established for the purpose of implementing the local Williamson Act Land Use Contract program and only property designated for conforming agricultural uses may qualify.

1.5 Project Facilities

1.5.1 Project Phasing

The Project is proposed to be to constructed in two phases. Phase 1 would involve construction of only the recharge and recovery facilities connecting to the AVEK West Feeder. This would allow WDS to operate the recharge and recovery facilities within the current capacity of the AVEK West Feeder.

Phase 2 would involve connecting the recharge and recovery facilities to the California Aqueduct to increase the total capacity of the Project. This could be accomplished by either connecting the recharge and recovery facilities to the LAA #2 (Option A), or by constructing the previously mentioned new pipeline, approximately 7 miles long, parallel to the existing LAA #2 alignment (Option B). Figure 1-2 shows both Phase 1 and Phase 2 components.

1.5.2 Phase 1 Facilities

The facilities that would be constructed and operated during Phase 1 of the Project are described below and include:

- recharge basins on 1,200–1,500 acres (Figure 1-2);
- a 4-mile-long distribution pipeline to distribute water to and from the AVEK West Feeder (Figure 1-2);
- 30–40 new recovery wells and pumps, with use of existing wells as appropriate; and
- approximately 21 miles of recovery pipelines to convey water from the recovery wells back to the AVEK West Feeder.

1.5.2.1 Recharge Basins

WDS would construct basins to recharge SWP water in currently dewatered portions of the underlying aquifer. Soils in the Project area would be redistributed to create depressions and berms encompassing these depressions. Between 400,000 and 700,000 cubic yards of soil would be disturbed, although much of this disturbance would be in a manner that is similar to current farming practices. This redistribution would require the use of heavy construction equipment. The recharge basins would be divided into subbasins ranging from 1 to 50 acres, with an average area of approximately 20 acres each. Collectively the subbasins would cover approximately 1,200–1,500 acres. Surface water delivered to the basins would percolate through the subsurface of the basins to be stored in the underlying aquifer.

1.5.2.2 Distribution Pipeline

SWP water would be delivered to the recharge basins via the AVEK West Feeder. This pipeline currently connects to the California Aqueduct south of the Project area (Figure 1-1). The AVEK West Feeder pipeline is a 33- to 66-inch-diameter, underground steel pipeline with a capacity of 225 cubic feet per second (cfs). It also includes an existing diversion valve (Turnout 20A) near the intersection of Gaskell Road and 140th Street West, approximately 1 mile east of the proposed location of the recharge basins (Figure 1-2).

To connect the recharge basins to the AVEK West Feeder (and the California Aqueduct), an up to 84-inch-diameter pipeline (potentially sized to accommodate Phase 2), approximately 4 miles long, would be installed from the VanDam Turnout to the northwest corner of the recharge basin area, just east of LAA #2 (Figure 1-2). The distribution pipeline would be aligned along existing roadways. The connection between the AVEK West Feeder and the distribution pipeline would be buried and constructed of reinforced concrete pipe. The VanDam Turnout would be upgraded with a pump (known as a lift station) to allow delivery of water to the westernmost recharge basins. The upgraded turnout also would allow recovered water to be delivered back into the AVEK West Feeder. Although the new distribution pipeline would be buried, aboveground features, such as air vents, may be associated with the new pipeline.

1.5.2.3 Recovery Wells

When needed, the stored water would be recovered using groundwater wells similar to those already in use in the area for agriculture. Both existing and new wells would be used to recover stored water. WDS estimates that approximately 10 existing wells would be used and that 30–40 new wells would need to be constructed. Approximately 10 new wells would be initially installed in the immediate vicinity of the recharge basins with additional wells added in later years as needed. This approach will enable collection of data from the initial well field so as to optimize the designs, numbers and locations of additional wells.

Some of the wells would be located in the immediate vicinity of the recharge basins, and others would be located to the east and northeast of the recharge basins (i.e., downgradient relative to the direction of groundwater flow) within the area defined for recharge and recovery facilities (Figure 1-2). The configuration of the wells and pipelines is in the preliminary design stage and contingent on final design and securing of required access agreements. WDS intends to construct pipelines and wells along existing roadways, and the construction of wells will be restricted to areas zoned for agriculture. Most new wells would be located on land owned by third parties, and easements or access agreements would be required for their construction.

1.5.2.4 Recovery Pipelines

The recovered water would be collected via a system of buried pipelines (up to 21 miles of 14- to 38-inch-diameter pipe) for delivery back into the AVEK West Feeder. All recovery pipelines would be aligned beneath agricultural land or roadway shoulders. As noted above for new recovery wells, the configuration of the wells and pipelines is in the preliminary design stage. The pipelines would be located within the area defined for recharge and recovery facilities (Figure 1-2). Most recovery pipelines would be located on land owned by third parties, and easements or access agreements would be required for their construction.

1.5.3 Phase 2 Facilities

Phase 2 of the Project is made up of two options, Option A and Option B, to increase the capacity of the recharge and recovery facilities beyond that available via the AVEK West Feeder. Both of the options would allow SWP water to be delivered from the California Aqueduct to recharge facilities for storage and would allow recovered water to be delivered back to the California Aqueduct.

1.5.3.1 Option A: Use of the Los Angeles Aqueduct #2

Option A proposes to use LAA #2, which runs adjacent to the western border of the area proposed for the recharge basins, to convey water between the recharge and recovery facilities and the California Aqueduct. LAA #2 is a 120-inch-diameter, underground steel pipeline with a capacity of 290 cfs, which passes under the California Aqueduct approximately 7 miles south the recharge and recovery area (Figure 1-1). WDS would construct a connection between the LAA #2 and the California Aqueduct where the LAA #2 passes under the California Aqueduct. At that point, the California Aqueduct is a concrete-lined canal with a capacity of 2,010 cfs. A concrete vault that could accommodate a lift station already exists at this location.

WDS also would construct a connection between the LAA #2 and the western end of the new 4-mile-long distribution pipeline (constructed during Phase 1). Lift stations (pumps) would be installed at the connection between the LAA #2 and the California Aqueduct and at the connection between the LAA #2 and the new 4-mile-long distribution pipeline (Figure 1-2).

1.5.3.2 Option B: Construction of a New Delivery Pipeline

If LAA #2 is not available to the Project, Option B would be implemented. This option would involve construction of a new 7-mile-long pipeline parallel to the

LAA #2 (Figure 1-2). Option B would connect the south end of the new delivery pipeline to the California Aqueduct and the north end of the new delivery pipeline to the 4-mile-long distribution pipeline installed during Phase 1. The connections to the new delivery pipeline would be constructed of reinforced concrete pipe. The new delivery pipeline would be buried; however, aboveground features, such as air vents, may be associated with the new pipeline. As proposed under Option A, lift stations (pumps) would be installed at each end of the new delivery pipeline.

1.5.4 Construction Schedule

Phase 1 of the Project would begin within 6-months of EIR certification (to allow for finalization of permitting and Phase 1 design). It is estimated that construction could commence by the middle of 2006. Construction of the distribution pipeline and recharge basins is anticipated to require about 6 months. Following construction of those facilities, WDS could begin recharging imported water.

Following the recharge season of 2006-2007, WDS would install the first group of approximately 10 recovery wells and recovery pipelines between and adjacent to the recharge basins. In later years, as needed, depending on the availability of stored water for recovery and the performance of existing wells, WDS would install additional wells and recovery pipelines.

Phase 2 of the Project would not begin until after at least 1 full year of Phase 1 operations. Phase 2 construction may require approximately 6 months (Option A) to 12 months (Option B) to complete, depending on which option is implemented.

1.6 Project Operations

As proposed, the Project would receive imported SWP water via the East Branch of the California Aqueduct. Project participants who have existing entitlements to available SWP water would provide the water. The Project would be designed to receive water at a rate of up to 350 cfs and to recharge up to 100,000 acre-feet (af) per year, contingent on wheeling capacity in the AVEK West Feeder and Phase 2 pipelines.

Surface water recharged in the basins would percolate through the subsurface for storage in dewatered portions of the underlying aquifer. The total storage capacity of the Project would be 500,000 af. Recharge activities would occur primarily during the winter. The recharge basins would be leased for organic farming when not required for recharge activities.

When needed, the stored water would be recovered using groundwater wells. The recovered water would be conveyed via either the new Project pipelines into the AVEK West Feeder or the California Aqueduct for delivery to water users.

The recovery of stored water would be limited to 90% of the amount recharged, thereby helping reduce the rate of overdraft of the underlying aquifer.

1.7 Monitoring Committee

Recharge operations would cause the water table to rise above baseline conditions, and recovery operations would cause water levels to decline back to near baseline conditions. Over the long run, water levels would rise above baseline conditions because 10% of recharged water would be left behind to aid in overdraft recovery. The applicant has included a committee as a design feature of the project. The committee, as proposed, would be formed to monitor the impact of operations on groundwater levels and quality and to ensure that neighboring landowners are protected. Composition of the committee potentially includes the following representatives:

- the owner/operator,
- Rosamond Community Service District,
- Non-owner/operator participants, and
- the Antelope Valley State Water Project Contractors Association.

1.8 Additional Discretionary Actions/Required Approvals

Before the Project can be implemented, several agencies may be required to approve or authorize various elements of the Project. Additional requirements may be identified as project planning and agency consultations continue.

1.8.1 Kern County

In addition to the discretionary actions described in Section 1.4, grading permits for construction of the basins and encroachment permits for any construction on county maintained roadways may be necessary.

The Kern County Board of Supervisors adopted Ordinance No G-6502 on June 11, 1998, to regulate the export or transfer of native groundwater outside of Kern County. The ordinance only applies to the transport or transfers of native groundwater from or taking place in unincorporated areas of Kern County. The term "native groundwater" does not include water that is both recharged through groundwater banking programs and that originates outside Kern County and its watershed areas. This Project is designed with the intent of this ordinance in mind, and will not export any native groundwater. Additionally, to account for

losses during both transport through and storage in Kern County, no more than 90% of the water delivered to the groundwater bank may be recovered.

1.8.2 Regional Actions or Approvals

The Project would require permits, approvals, or authorizations from several regional agencies, which are described below.

1.8.2.1 Antelope Valley East Kern Water Agency

Approval would be required from AVEK for additional turnouts and for the connection between the Project and AVEK's Western Feeder.

1.8.2.2 Kern County Air Pollution Control District

If propane-powered engines are used to drive the water pumps, permits may be required from the Kern County Air Pollution Control District (KCAPCD).

1.8.2.3 Los Angeles Department of Water and Power

Approval would be required from the Los Angeles Department of Water and Power (LADWP) for the connections between the LAA #2 and the Project and between LAA #2 and the California Aqueduct.

1.8.2.4 Antelope Valley Air Quality Management District

If propane-powered engines are used to drive the water pumps, permits may be required from the Antelope Valley Air Quality Management District (AVAQMD).

1.8.3 State Agency Actions or Approvals

The Project would require permits, approvals, or authorizations from several state agencies, including the:

- Department of Water Resources (DWR), which must approve of conveyances to and from the California Aqueduct;
- California Department of Health Services (DHS), which may require that a public water system permit be obtained because water recovered from the Project could be pumped into the Los Angeles Aqueduct for municipal and industrial use; and
- Lahonton Regional Water Quality Control Board (RWQCB), which must authorize proposed construction activities under the RWQCB's General Permit for Storm Water Discharges Associated with Construction Activity (General Construction Permit).

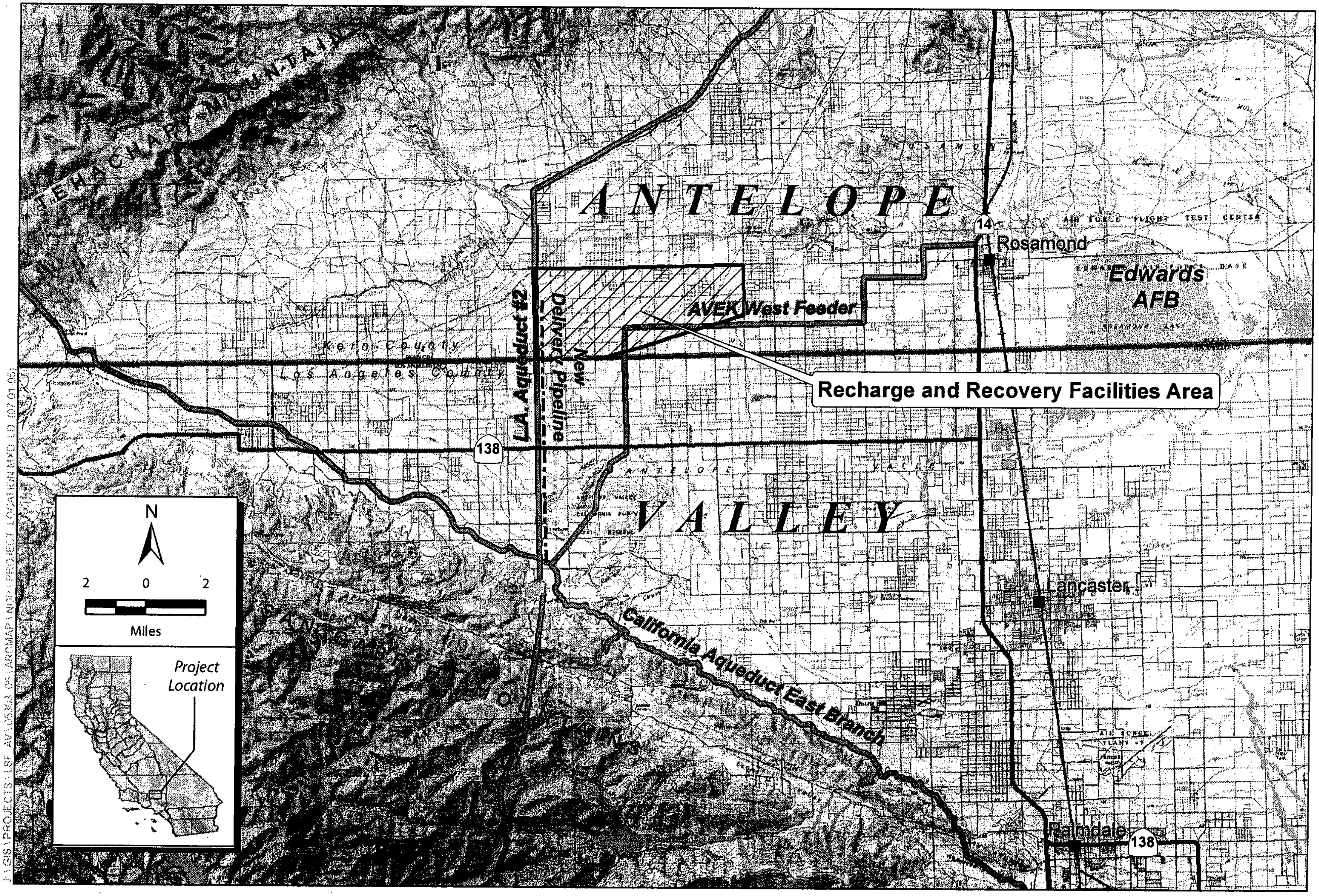
1.8.4 Federal Agency Actions or Approvals

To date, WDS has not identified specific activities that would require a permit, approval, or authorization from a federal agency. WDS is communicating with Edwards Air Force base to ensure that flyway impacts, if any, are considered.

1.9 Alternatives to the Proposed Project

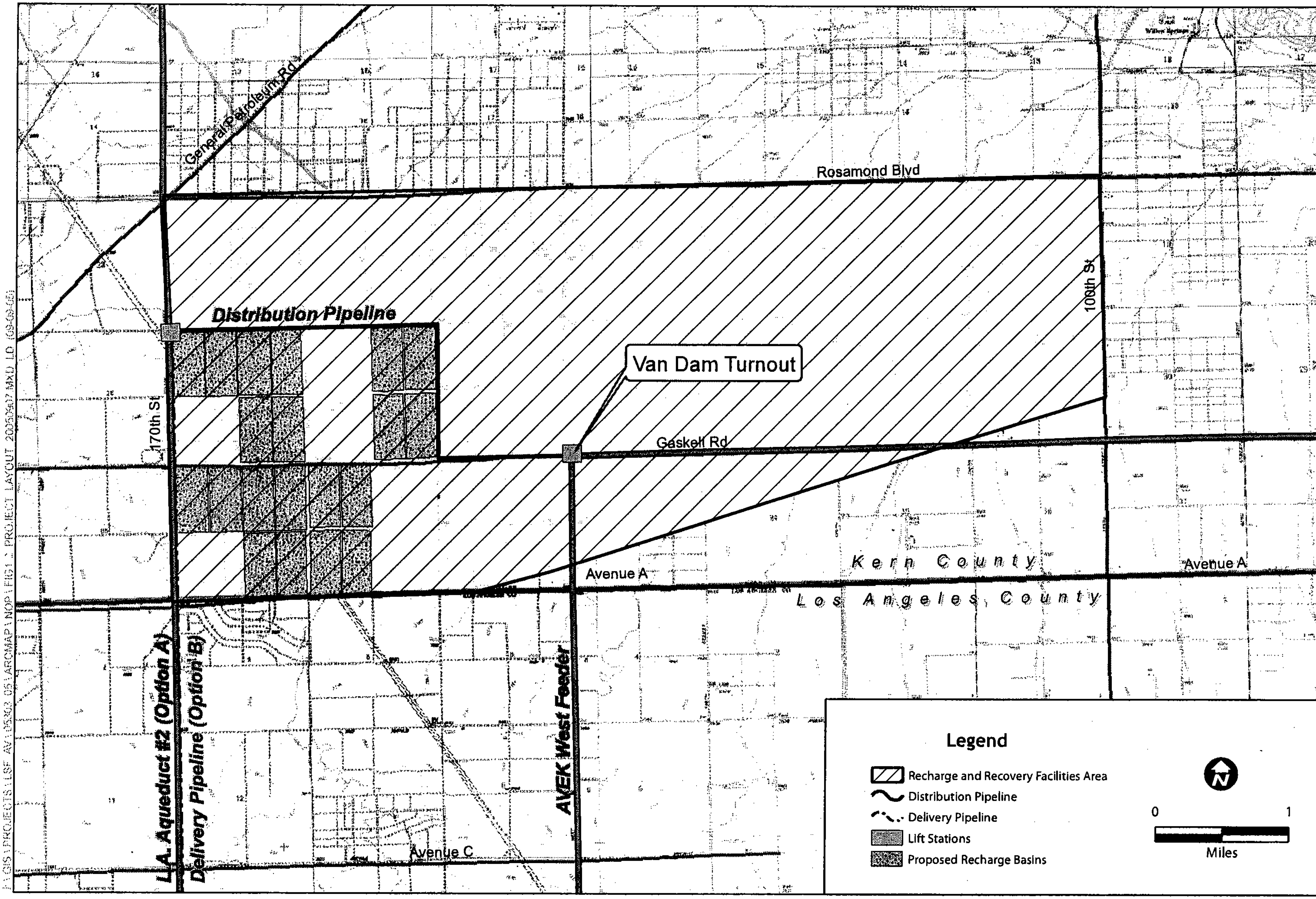
The environmental impact report (EIR) will consider a range of feasible alternatives that will be identified to avoid or substantially reduce significant environmental impacts. The types of alternatives considered may include:

- other locations in or near Antelope Valley;
- use of injection wells to place imported surface water into the aquifer;
- traditional (surface) reservoirs to store imported surface water; and
- in-lieu recharge, where imported surface water would be supplied to farmers for irrigation, thus resulting in the accumulation of stored groundwater in an amount approximately equal to that which would otherwise be extracted by pumping for agricultural purposes.



Jones & Stokes

Figure 1-1
Project Location



Jones & Stokes

Figure 1-2
Project Layout

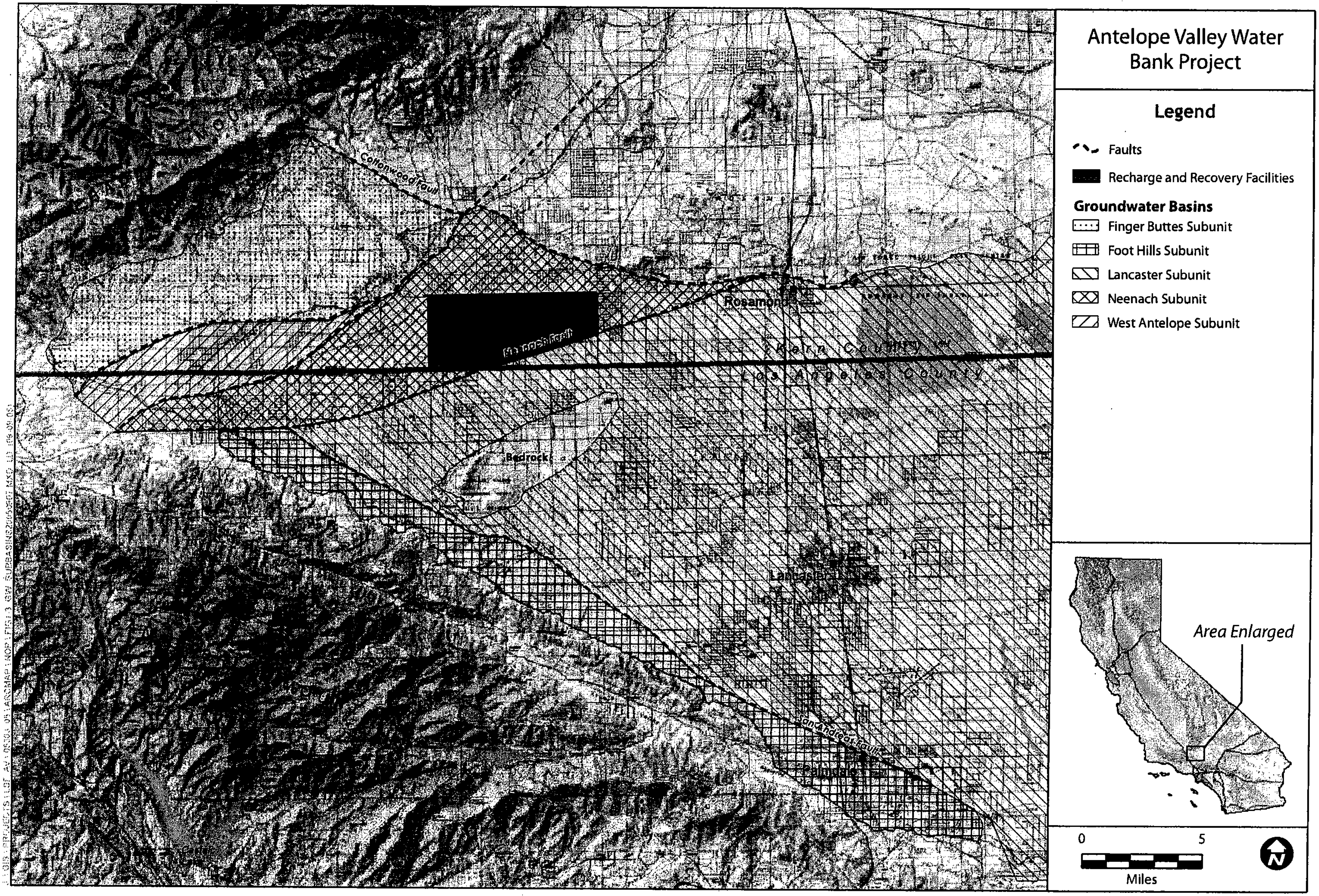


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Figure 1-3
Groundwater Subbasins

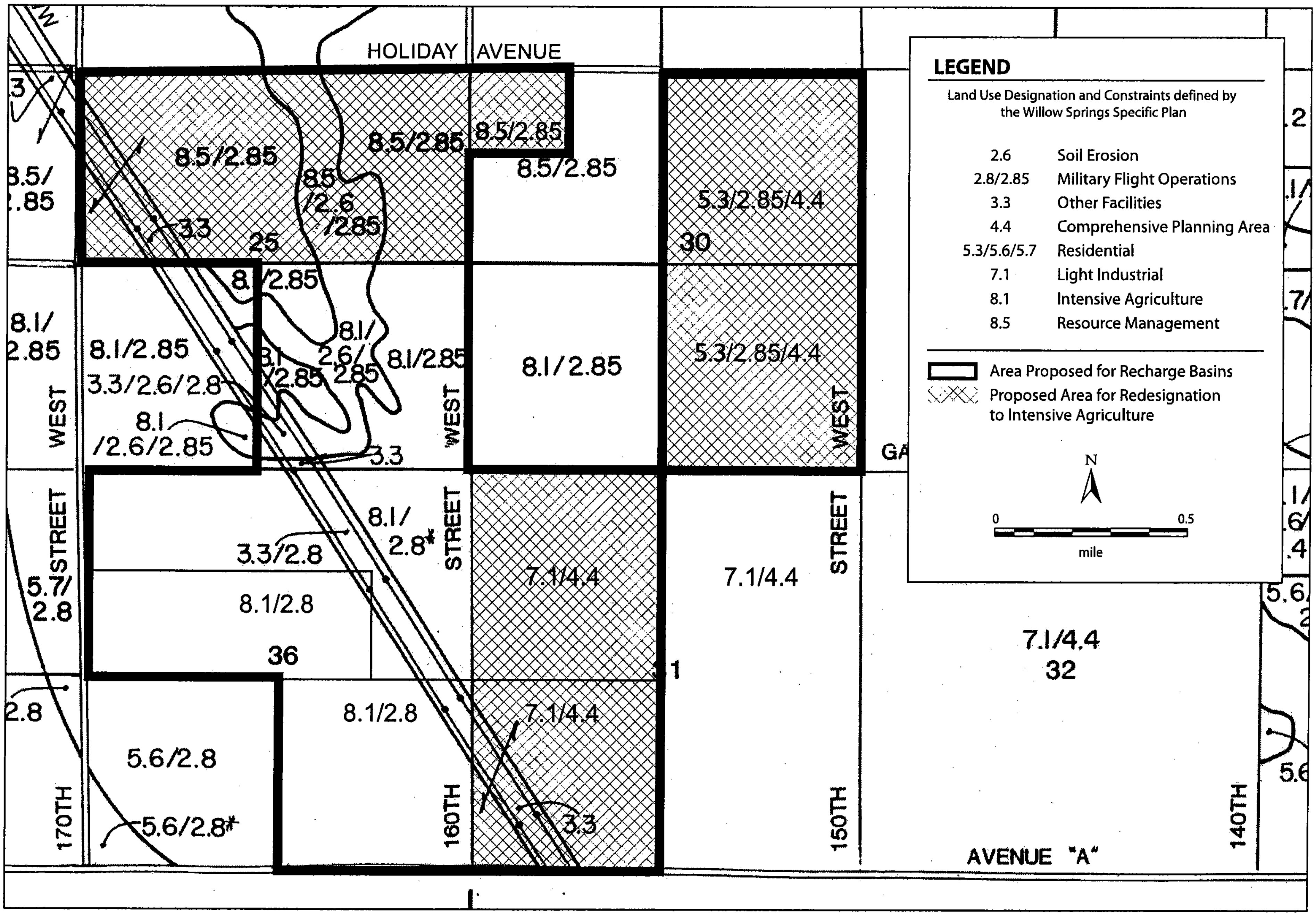

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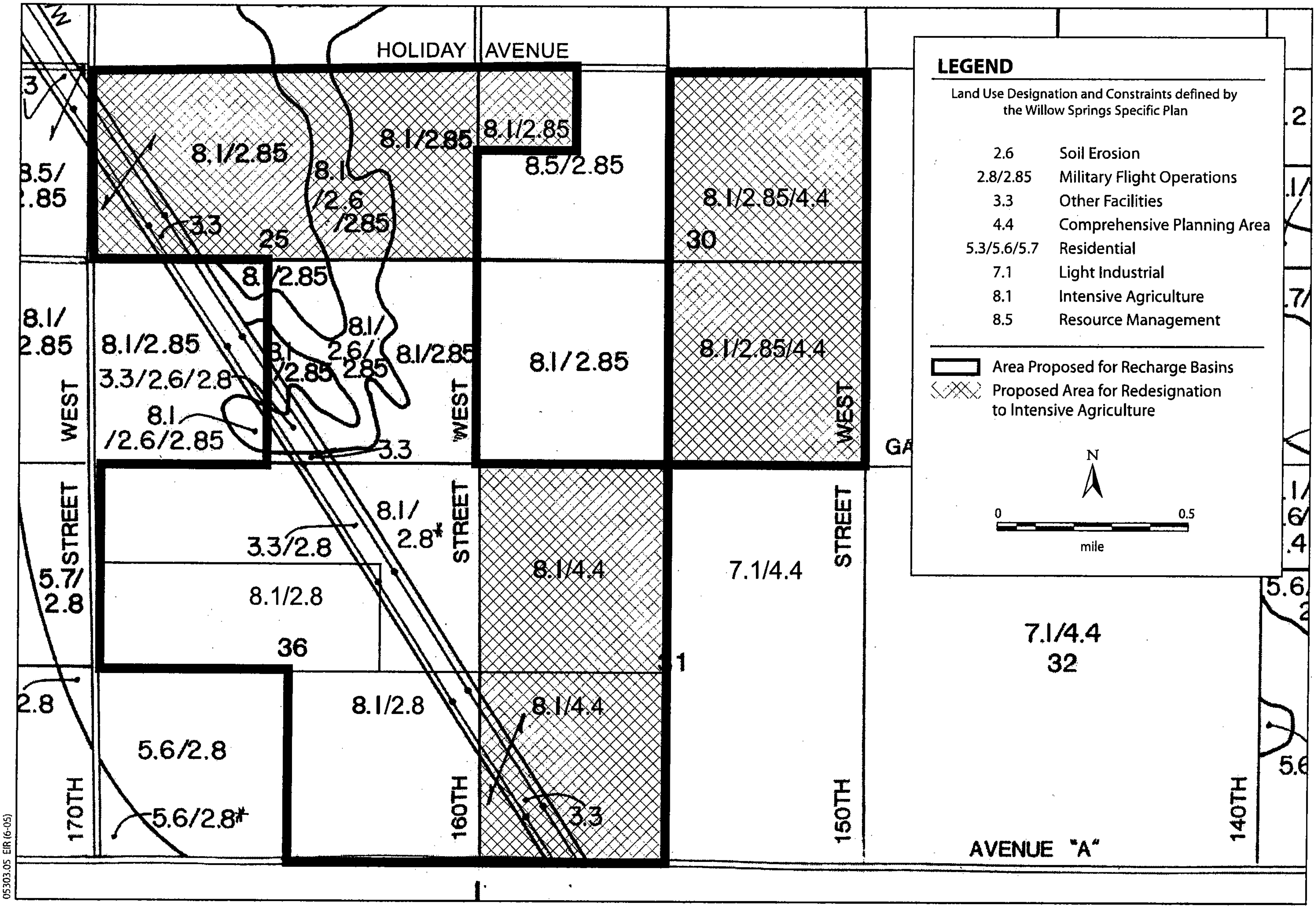
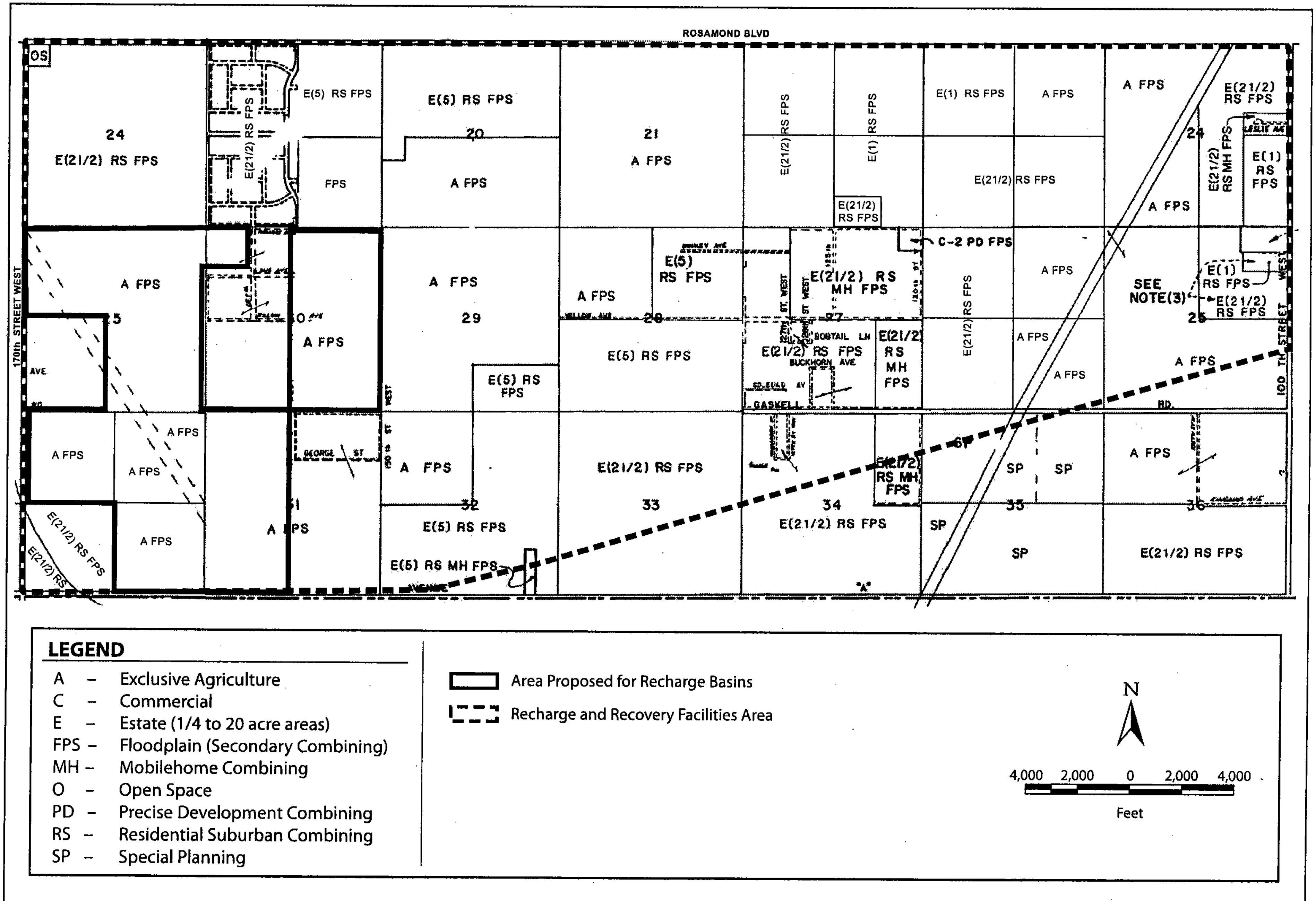
Figure 1-4
Willow Springs Specific Plan
Current Land Use Designation Map



05303.05 EIR (6-05)

Jones & Stokes

Figure 1-5
Willow Springs Specific Plan
Project-Proposed Land Use Designation Map



05303.05 EIR (6-05)

Jones & Stokes

Figure 1-6
Kern County Zoning Designations

Chapter 2
Environmental Checklist Form

Environmental Factors Potentially Affected:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☒ Agriculture Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Geology and Soils
☒ Hazards / Hazardous Materials	☒ Hydrology and Water Quality	☒ Land Use and Planning
☒ Mineral Resources	☒ Noise	☒ Population and Housing
☐ Public Services	☐ Recreation	☒ Transportation and Traffic
☒ Utilities and Services	☒ Mandatory Findings of Significance	☐

DETERMINATION. (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a potentially significant impact or potentially significant unless mitigated impact on the environment, but at least one effect (a) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (b) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENT IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	September 21, 2005 Date
Don Kohler Printed Name	Kern County Planning Department For

Evaluation of Environmental Impacts:

(1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A No Impact answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

(2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

(3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

(4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measure and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses", may be cross-referenced).

(5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or Negative Declaration, Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

  (a) Earlier Analysis Used. Identify and state where they are available for review.

  (b) Impacts Adequately Addressed. Identify which effects from the above checklist where within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

  (c) Mitigation Measures. For effects that are "Less Than Significant With Mitigation Measures Incorporated", describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

(6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

(7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

(8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

(9) The explanation of each issue should identify:

  (a) The significance criteria or threshold, if any, used to evaluate each question.

  (b) The mitigation measure identified, if any, to reduce the impact to less than significance.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
I. **AESTHETICS.** Would the project:				
(a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
(b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
(c) Substantially degrade the existing visual character or quality of the site and its surroundings	☐	☐	☒	☐
(d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

(a) The Project is located within a basin in the west end of the Antelope Valley. The valley is bounded by the Tehachapi Mountains to the northwest and the San Gabriel Mountains to the southwest. As defined by the Kern County General Plan and Willow Springs Specific Plan, the recharge and recovery facilities would not be within a scenic vista. The Phase 2 underground delivery pipeline running through Los Angeles County parallel to the LAA #2 is not in a designated scenic vista. Therefore, the Project would not affect a scenic vista.

(b) The Project is not located near any designated scenic highways or near any highways that are currently eligible for such designation. No historical buildings, trees, or rock outcroppings would be affected as a result of the Project; therefore, there would be no impacts to scenic resources within a state scenic highway.

(c) The Project land cover types consist of active agricultural, grazing, and undeveloped land in a relatively flat and rural setting. Recharge basins would occupy 1,200–1,500 acres. The recharge basins would be constructed by creating berms and depressions in the land. Additional facilities would include subgrade piping, low earthen berms, and wells. The recharge basins would alter the visual character to some extent, and construction would temporarily degrade the visual character; however, current farming practices would remain in the area of recharge basins 8–10 months of the year, and much of the Project includes the belowground features. Therefore, there would be no significant change in the aesthetic character of the area as a result of the Project. This impact would be less than significant.

(d) The recharge basins within the recharge and recovery facilities may introduce a new source of glare to the Project area. When in use for recharge (2–4 months of the year), the basins would resemble flooded farm fields. At other times (8–10 months of the year), the basins are likely to have crops in production on the surface of the basin. These proposed conditions would be similar to current conditions. This impact would be less than significant.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
II. AGRICULTURE RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
(a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?	☐	☐	☒	☐
(b) Conflict with existing zoning for agricultural use or a Williamson Act Contract?	☐	☐	☐	☒
(c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to nonagricultural use?	☒	☐	☐	☐
(d) Result in the cancellation of an open space contract made pursuant to the California Land Conservation Act of 1965 or Farmland Security Zone Contract for any parcel of 100 or more acres (Section 15206(b)(3) Public Resources Code)?	☐	☐	☐	☒

(a) The proposed Project would have short-term impacts on lands identified as Prime Farmland because the proposed water banking project would temporarily (2–4 months of the year) convert Prime Farmland to a nonagricultural (i.e., a noncultivation) land use during active recharge operations. However, because the Proponent would continue to lease the recharge basins for organic farming during nonrecharge periods (approximately 8–10 months of the year), the Project would not result in a permanent conversion of any Prime, Unique, or Statewide Important Farmland. The Project's impacts related to the conversion of Prime, Unique, or Statewide Important Farmland will be discussed in the EIR.

(b) As described above, although these parcels are not currently designated in the WSSP for agricultural uses, all of the parcels have been farmed since at least the 1960s. The proposed parcels for the recharge basins are currently zoned Exclusive Agriculture (A), and WDS shall constrain development of the recovery wells to parcels that are zoned Exclusive Agriculture (A) as well. Currently, only two

of the properties proposed as locations for recharge basin are enrolled in an existing Williamson Act contract. As part of the Project, the Proponent would enroll all of the parcels proposed for recharge basins into new Williamson Act contracts. Further, because water banking is considered to be a compatible land use in the Exclusive Agriculture zoning districts and the Proponent would continue to lease portions of the site for agricultural purposes during nonrecharge periods, the Project would not result in a significant conflict with the current agricultural uses of the site, nor would the Project conflict with an existing Williamson Act contract. There would be no impact.

(c) The Project would result in minor changes in current agriculture practices at the site by limiting production to approximately 8–10 months of the year. Although the Project area is located in an area planned for industrial development under the WSSP, the site itself and much of the land surrounding the site has historically, and is currently, used for agricultural purposes. Because one of the Project's objectives is to increase water supply reliability for municipal and industrial users, there is a potential for the Project to accommodate conversion of farmland elsewhere. This impact is potentially significant.

(d) The Project does not propose to cancel contracts made pursuant to the California Land Conservation Act or Farmland Security Zone Contract. Existing contracts would continue, even though farming practices would be modified. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
(a) Conflict with or obstruct implementation of the applicable air quality plan?	☒	☐	☐	☐
(b) Violate any air quality standard as adopted in (c)i, (c)ii, or as established by EPA or air district or contribute substantially to an existing or projected air quality violation?	☒	☐	☐	☐
(c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? Specifically, would implementation of the project exceed any of the following adopted thresholds:				
i. San Joaquin Valley Unified Air Pollution Control District:				
Operational and Area Sources				
Reactive Organic Gases (ROG) 10 tons per year.	☐	☐	☐	☒
Oxides of Nitrogen (NO_x) 10 tons per year.	☐	☐	☐	☒
Particulate Matter (PM_{10}) 10 tons per year.	☐	☐	☐	☒
Stationary Sources - as determined by District Rules				
Severe Nonattainment 25 tons per year.	☐	☐	☐	☒
Extreme Nonattainment 10 tons per year.	☐	☐	☐	☒
ii. Kern County Air Pollution Control District.				

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
Operational and Area Sources				
Reactive Organic Gases (ROG) 25 tons per year.	☒	☐	☐	☐
Oxides of nitrogen (NO_x) 25 tons per year.	☒	☐	☐	☐
Particulate Matter (PM_{10}) 15 tons per year.	☒	☐	☐	☐
Stationary Sources - determined by District Rules 25 tons per year.	☒	☐	☐	☐
(d) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
(e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

(a) The Project's recharge and recovery facilities are within the KCAPCD's boundaries. The new delivery pipeline would be within the AVAQMD's boundaries. Construction of the Project would result in temporary increased emissions in the Project area. Construction would involve excavation for the recharge basins and installation of pipelines, new wells, and lift stations. During construction of the recharge and recovery facilities, criteria air pollutant emissions may exceed adopted thresholds, which could affect attainment of adopted regional air quality goals. This impact is potentially significant.

(b-c) The Project would result in short-term construction-related air pollutant emissions, particularly dust (PM10), reactive organic gases (ROG), nitrogen oxides (NOx), and carbon monoxide (CO). These emissions could temporarily exceed adopted standards. In addition, the Project could periodically result in extra pumping above what is currently occurring. This additional pumping could increase air pollutant emissions above the adopted KCAPCD or AVAQMD thresholds, which would be a potentially significant impact.

(d) Residential areas, hospitals, daycare centers, schools and other land uses where people may congregate are considered sensitive receptors. The recharge and recovery facilities are surrounded by agricultural and grazing land cover types, and the nearest residential area is the community of Rosamond, approximately 10 miles east of the Project area. The land uses on the delivery pipeline alignment are generally agriculture or undeveloped. Impacts to the scattered residences will be assessed in the EIR.

(e) The Project is not expected to create objectionable odors. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES. Would the project:				
(a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans. policies, or regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
(b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
(c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
(d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☒	☐	☐	☐
(e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☒	☐	☐	☐
(f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☒	☐	☐	☐

(a) Wildlife species, such as burrowing owl Swainson's hawk, Le Conte's Thrasher, mountain plover, American badger, and coast horned lizard have been documented within 3 miles of areas proposed for construction. The Project could have an adverse effect on such sensitive wildlife and plant species. Surveys would be conducted to determine potential effects on biological resources. This impact is potentially significant.

(b) Most of the Project is within agriculture or undeveloped lands. No naturally occurring assemblage of plant species representing a natural vegetation/habitat type occurs in the area proposed for the recharge and recovery facilities. Habitat surveys will be conducted along the proposed alignment of the Phase 2 delivery pipeline. This impact is potentially significant.

(c) No wetlands or other waters of the United States have been observed in the area proposed for the recharge and recovery facilities. Habitat surveys will be conducted along the proposed alignment of the Phase 2 delivery pipeline. This impact is potentially significant.

(d) The agricultural fields in the Project area may provide suitable foraging habitat for migratory birds. Impacts related to migratory birds will be evaluated in the EIR.

(e) The proposed Project pipeline may traverse a Significant Ecological Area (SEA) designated by Los Angeles County. Development or construction that occurs within an SEA should be designed in a manner that is consistent with overall intent of the SEA program and balances conservation of important natural resources with the Project. This impact is potentially significant.

(f) The Project area lies in the California Desert Conservation Area (CDCA); however, there are no proximate BLM lands. The U.S. Bureau of Land Management developed a management plan for the CDCA in 1980, and Kern County, in conjunction with other counties and cities, is processing the West Mojave Plan, a Habitat Conservation Plan (HCP). The HCP has not been adopted yet. The EIR will identify potential conflicts between the Project, the CDCA management plan and the proposed HCP.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
V. CULTURAL RESOURCES. Would the project:				
(a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☒	☐	☐	☐
(b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☒	☐	☐	☐
(c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☒	☐	☐	☐
(d) Disturb any human remains, including those interred outside of formal cemeteries?	☒	☐	☐	☐

(a) Although most of the Project area is actively farmed and the soil has been disturbed, the potential exists for buried historical resources to be disturbed or destroyed during construction. A records search and surveys will be conducted to determine the potential to affect cultural resources. The results will be discussed in the EIR. This impact is potentially significant.

(b-d) The Project area may contain previously undiscovered archaeological, paleontological, or geological resources below the ground surface. These resources cannot be discovered by a surface survey but may be discovered during Project construction. This impact is potentially significant.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
VI. GEOLOGY AND SOILS. Would the project:				
(a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☒	☐	☐	☐
ii. Strong seismic groundshaking?	☒	☐	☐	☐
iii. Seismic-related ground failure, including liquefaction?	☒	☐	☐	☐
iv. Landslides?	☐	☐	☐	☒
(b) Result in substantial soil erosion or the loss of topsoil?	☒	☐	☐	☐
(c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☒	☐	☐	☐
(d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
(e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☒	☐	☐	☐

(ai- aii) The Project is not located in a Fault Zone Area, as determined by the California Geological Survey. However, the recharge and recovery facilities are located in the Neenach Subbasin. Three fault zones define the Neenach Subbasin: the Neenach fault to the south, the Willow Springs fault to the west, and the Randsburg-Mojave fault to the northwest. Seismicity in the Antelope Valley may have potentially significant impacts on the proposed pipelines in the Project area. This potentially significant impact will be evaluated in the EIR.

(aiii) Soils susceptible to liquefaction occur in the Project area. The near-surface soils in the Project area are sands, silty sands, silty gravels, and poorly graded gravels. The deeper deposits (Older Quaternary Alluvium) are poorly sorted sand with some gravel, silt, and clay and extend to depths of 1,600–1,900 feet bgs. This potentially significant impact will be evaluated in the EIR. Specific impacts related to liquefaction will be analyzed in the EIR.

(aiv) The Project area is located on relatively flat topography; therefore, a landslide from seismic activity is not likely to occur. No impacts would occur from landslides.

(b) The grading and soil stockpiling activities in the Project area may cause a temporary increase in wind and water erosion rates. This potentially significant impact will be evaluated in the EIR.

(c) See aiii, above.

(d) The Project area is not located in an area that has been identified as having a high potential for soil expansion. There would be no impact.

(e) The Project does not propose the construction of new septic tanks or alternative waste disposal systems. Continued use of existing septic tanks will be assessed in the EIR.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
VII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
(a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☒	☐	☐	☐
(b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☒	☐	☐	☐
(c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 1/4 mile of an existing or proposed school?	☐	☐	☐	☒
(d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
(e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☒	☐	☐	☐
(f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☒	☐	☐	☐
(g) Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
(h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
are adjacent to urbanized areas or where residences are intermixed with wildlands?				
(i) Would implementation of the project generate vectors (flies, mosquitoes, rodents, etc.) or have a component that includes agricultural waste? Specifically, would the project exceed the following qualitative threshold:				
i. Occur as immature stages and adults in numbers considerably in excess of those found in the surrounding environment; and	☒	☐	☐	☐
ii. Are associated with design, layout, and management of project operations; and	☒	☐	☐	☐
iii. Disseminate widely from the property; and	☒	☐	☐	☐
iv. Cause detrimental effects on the public health or well being of the majority of the surrounding population.	☒	☐	☐	☐

(a) Hazardous materials, such as diesel fuel and propane, would be used and transported during construction and operation of the Project and could present a significant hazard to the public or environment. This impact is potentially significant.

(b) The use of oil, hydraulic fluid, diesel fuel, gasoline, and other liquid hazardous materials would be used during construction of the Project and could pose a risk to the environment and human health through reasonably foreseeable upset and accidental release or spill conditions. This impact is potentially significant.

(c) The Project is not located within ¼ mile of an existing or proposed school. There would be no impact.

(d) The Project is not located on a site that is included on a list of hazardous materials sites pursuant to Government Section 65962.5. There would be no impact.

(e) The Project's recharge and recovery facilities are approximately 15 miles west of Edward's Air Force Base and within an airspace corridor for flight operations and within 1 mile of a private airstrip. During months of recharge, the recharge basins may attract birds and, thereby, increase the potential for bird/aircraft strike hazard (BASH). This impact is potentially significant.

(f) The nearest private airport, Skyotee Ranch Airport, is less than 1 mile northeast of the Project area. The Project may have a potentially significant impact on safety for people using and working at the airport.

(g) The Project would not block or close down roads or impair implementation of any emergency response or evacuation plans. No impacts would occur.

(h) Farmland and undeveloped and grazing land that do not contain substantial flammable brush surround the site. There would be no impact.

(i) The Project recharge basins may support mosquitoes. All species of mosquitoes require standing water to complete their growth cycle; therefore, any standing body of water represents a potential mosquito-breeding habitat. This potentially significant impact will be evaluated in the EIR.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
VIII. HYDROLOGY AND WATER QUALITY. Would the project:				
(a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐
(b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
(c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on site or off site?	☒	☐	☐	☐
(d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on site or off site?	☐	☐	☐	☒
(e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
(f) Otherwise substantially degrade water quality?	☒	☐	☐	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
(g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
(h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☒	☐	☐	☐
(i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
(j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

(a) Construction of the recharge basins and installation of recovery wells and pipelines would require grading and excavation. Construction has the potential to expose bare soils during the winter rainfall period and to generate stormwater runoff. Stormwater runoff may cause soil erosion of disturbed sites and transport other construction-related contaminants to nearby receiving waters, thereby impairing water quality and aquatic organisms and their habitats. Increasing water levels may also increase the susceptibility of neighboring wells to contamination from land surface activities, such as waste disposal or agricultural drainage by reducing the effective depth of unsaturated soils, where most contaminant attenuation occurs. Potentially significant impacts on water quality will be evaluated in the EIR.

(b) The Project proposes to recharge imported surface water in the depleted aquifer. Ten percent of the stored water would be left behind (never recovered by the Project), thereby reducing the rate of aquifer overdraft. An oversight committee would ensure that localized and temporary changes in the groundwater levels that may be attributable to the Project would not adversely affect existing or planned land uses. This impact would be less than significant.

(c) The Project area is fairly level and not adjacent to any streams or rivers. Ground-disturbing activities that would occur during the construction of the Project could result in minor, temporary alterations to local drainage patterns. During construction, the removal of crops and excavation may temporarily alter erosion; however; the completed Project will maintain the existing drainage pattern of the area. Also, because the Project area is relatively flat, erosion and siltation caused by construction would be minimal. Siltation on site has the potential to occur, depending on the total suspended sediments (TSS) in the source water coming into the recharge basin. The California Aqueduct may have substantial TSS at certain times of the year. This impact is potentially significant.

(d) The Project area is fairly level and not adjacent to any streams or rivers. Ground-disturbing activities that would occur during the construction of the Project could result in minor, temporary alterations to

local drainage patterns. However, these alterations would be minor and would not affect on- or off-site flooding. There would be no impact

(e) Ground-disturbing activities that would occur during construction of the Project could result in minor, temporary alterations to local drainage patterns but would not substantially increase the amount of impervious surface area in the Project area. No additional sources of runoff would be created. There would be no impact.

(f) The Project proposes to import water from the SWP (California Aqueduct). Potentially significant impacts to groundwater quality associated with the recharge of imported surface water will be analyzed in the EIR.

(g) The Project does not propose residential housing. There would be no impact.

(h) Portions of the Project are located in a 100-year flood hazard area. This potentially significant impact will be evaluated in the EIR.

(i) The recharge basins may pose a potential public hazard, with the risk of berm failure causing flooding. These basins would be excavated, and some spoils would be used to form low berms to achieve an effective depth of approximately up to 3-5 feet to prevent wind-induced waves from overtopping the berms. Berm heights would vary, depending on topography, but would not exceed 5 feet. The methods used to construct the berms are designed to minimize the potential for berm failure. Therefore, this impact is less than significant. This impact will be described in the EIR.

(j) The Project area is not located near any significantly sized enclosed body of water or coastal area and is, therefore, not susceptible to a seiche or tsunami. The site is not located at the foot of any significant topographical feature subject to a mudflow. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
IX. LAND USE AND PLANNING. Would the project:				
(a) Physically divide an established community?	☐	☐	☐	☒
(b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
(c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☒	☐	☐	☐

(a) The recharge and recovery facilities and potential delivery pipeline are located in a rural area, surrounded by agricultural lands and rural homesteads in unincorporated areas of Kern County and Los Angeles County. The Project would not physically divide an established community near or in the Project area. Project construction and operation would not restrict movement through or around the area because the Project does not include construction of new roads, bridges, or other common physical barriers to movement through the area. The pipelines that would be constructed would be below ground and would not restrict movement across their alignment. The Project would not result in the division of an established community. There would be no impact.

(b) The recharge and recovery facilities are proposed for areas that are subject to the WSSP (Kern County Department of Planning and Development Services 1992), a Specific Plan document to be an amplification of the goals and policies of the Kern County General Plan. One of the stated goals of the WSSP is to foster the development of industrial parks, though such development has not occurred at or near the recharge and recovery facilities. Of the 10 parcels planned for recharge basin construction, four are designated for Intensive Agricultural Uses. The other six parcels (approximately 988 acres) have the current land use designations of Resource Management, Residential, and Light Industrial. The Kern County Zoning Ordinance indicates a zoning designation for the entire recharge and recovery facilities area of A, Exclusive Agriculture (Kern County Department of Planning and Development Services 1969). The Project would not be consistent with the existing Specific Plan designations but would be consistent with the zoning designation for the area and current uses of the area. As part of this Project, the applicant is requesting a Specific Plan amendment to change the Specific Plan land use designations to Intensive Agriculture. The six parcels requested for redesignation are currently under cultivation or fallow. The Specific Plan amendment would be consistent with the current land use of the parcels, making this impact less than significant. Further, because the industrial land use designations were intended to promote economic growth and not to mitigate an environmental factor, the impact of amending the Specific Plan is considered less than significant. The impacts of the Specific Plan amendment and potential conflicts with County code and policies will be discussed in the EIR.

(c) The Project area lies in the CDCA. The U.S. Bureau of Land Management developed a management plan for the CDCA in 1980 and has drafted a habitat conservation plan (HCP) for the Western Mojave Desert, including Antelope Valley. The HCP has not yet been adopted. The EIR will identify potential conflicts between the Project and the CDCA management plan.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
X.	**MINERAL RESOURCES.** Would the project:				
(a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☒	☐	☐	☐
(b)	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

(a) The recharge and recovery site is located in the Neenach Subbasin. The near-surface soils are sands, silty sands, silty gravels, and poorly graded gravels. It is unlikely that the Project area would contain sand and gravel that would be adequate for construction purposes. However, there is the potential for the existence of subgrade material that could be suitable for infill purposes. This impact is potentially significant.

(b) The Project area is not designated as an important mineral resource recovery site in local plans. There would be no impact.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XI.	**NOISE.** Would the project:				
(a)	Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies?	☒	☐	☐	☐
(b)	Exposure of persons to, or generation of, excessive ground borne vibration or ground borne noise levels?	☐	☐	☒	☐
(c)	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
(d)	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
(e)	For a project located within the Kern County Airport Land Use Compatibility Plan, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐
(f)	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐

(a) Potential sources of noise associated with the Project include grading and construction activities associated with construction of the maintenance building, pipelines, and recharge basins; drilling of the wells; operation of the well pumps; and operation of the engines at the lift stations. This impact is potentially significant.

(b) The Project would not be expected to result in exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels. Sources of ground-borne noise, such as pile driving, are not proposed as part of the Project. Standard construction activities, such as grading, excavation, and site preparation, are not expected to generate significant vibration or ground-borne noise. This impact is less than significant.

(c) Noise levels in the Project area and along transportation routes to the Project area may increase as a result of the Project. This impact is potentially significant.

(d) Temporary noise impacts could occur from construction of the Project as a result of the use of construction equipment. This impact is potentially significant.

(e, f) The Project would not result in new residences or other sensitive receptors that could be exposed to airport noise. These impacts would be less than significant.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XII. POPULATION AND HOUSING. Would the project:				
(a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☒	☐	☐	☐
(b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
(c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

(a) The Project could indirectly induce growth because of increased water supply reliability. This impact is potentially significant.

(b) The Project does not propose the displacement of any existing housing. There would be no impact.

(c) The Project would not result in the displacement of any persons. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIII. PUBLIC SERVICES. Would the project:				
(a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services:				
Fire Protection?	☐	☐	☐	☒
Police Protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other Public Facilities?	☐	☐	☐	☒

(a) The Project would not result in substantial adverse physical impacts associated with any of the listed public services. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIV. RECREATION. Would the project:				
(a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
(b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

(a) The Project would not directly increase population or demand for recreational facilities. This impact would be less than significant.

(b) The Project does not include recreational facilities or require the construction or expansion of recreational facilities. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XV. TRANSPORTATION AND TRAFFIC. Would the project:				
(a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☒	☐	☐	☐
(b) Exceed, either individually or cumulatively, a Level of Service standard established by the county congestion management agency or adopted County threshold for designated roads or highways? Specifically, would implementation of the project cause the Level of Service (LOS) for roadways and/or intersections to decline below the following thresholds or further degrade already degraded segment(s):				
i. Metropolitan Bakersfield General Plan LOS "C"	☐	☐	☐	☒
ii. Kern County General Plan LOS "D"	☒	☐	☐	☐
(c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
(d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
(e)	Result in inadequate emergency access?	☐	☐	☐	☒
(f)	Result in inadequate parking capacity?	☐	☐	☐	☒
(g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

(a-b) The Project would not result in any substantial long-term increase in traffic. However, construction-related activities would result in greater-than-normal truck traffic along local roadways. This impact is potentially significant.

(c) The Project does not propose any changes in air traffic patterns. There would be no impact.

(d) The Project does not have any design features or incompatible uses that would result in hazardous traffic conditions. There would be no impact.

(e) The Project would not introduce residents or reasons to provide increased emergency access. There would be no impact.

(f) The Project would require parking for approximately six employees. Existing parking areas are adequate. There would be no impact.

(g) The Project is neither a residential nor employment-generating land use, and there is no need for alternative transportation facilities. There would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVI. UTILITIES AND SERVICE SYSTEMS. Would the project:				
(a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
(b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐
(c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
(d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
(e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
(f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
(g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

(a) The Project does not include or require wastewater treatment facilities. There would be no impact.

(b) The Project consists of a new water storage facility. This impact is potentially significant.

(c) The Project does not propose to expand or require new stormwater facilities. There would be no impact.

(d) The Project would be served through existing entitlements to water and would not require any additional entitlements to be granted by the state. There would be no impact.

(e) The Project would not create additional wastewater demand. There would be no impact.

(f-g) The Project would comply with federal, state, and local solid waste standards and would generate a relatively small volume of solid waste but would not affect a landfill. This impact would be less than significant.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE. Would the project:				
(a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
(b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☒	☐	☐	☐
(c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

(a) The Project could result in significant impacts to the environment. Specific impacts will be identified in the EIR.

(b) The Project has the potential to contribute to cumulative impacts associated with water quality and supply, air quality, noise, and traffic. These impacts will be evaluated in the EIR to determine whether the effects are cumulatively considerable.

(c) The Project could potentially result in environmental effects that have adverse impacts on human beings, either directly or indirectly. Potentially significant impacts associated with air and water quality and hazards could affect human populations. These impacts will be addressed in the EIR.

Chapter 3
References Cited

California Department of Conservation, Division of Land Resource Protection. 1999. *Kern County Interim-Important Farmland 1998*. Sacramento, CA.

Kern County Planning Department. 1970. *Kern County Zoning Map # 232*. Amended 2004. Available: <http://www.co.kern.ca.us/ess/zmapindx.asp>. Bakersfield, CA.

Kern County Planning Department. 1970. *Kern County Zoning Map # 233*. Amended 1992. Available: <http://www.co.kern.ca.us/ess/zmapindx.asp>. Bakersfield, CA.

Kern County Planning Department. 1992. *Willow Springs Specific Plan*. Bakersfield, CA.

AGENDA

KERN COUNTY PLANNING DEPARTMENT
Scoping Meeting
Kern County Public Services Building
2700 "M" Street, Conference Room 1B, Bakersfield, California
October 4, 2005 – 1:30 p.m.

Pursuant to revised Section 21083.9 of the Public Resources Code, California Environmental Quality Act, effective January 1, 2002, this scoping meeting is being held to receive agency comments on the preparation of Environmental Impact Reports (EIR) on certain projects. The process of determining the scope, focus and content of the EIR is known as "scoping." Scoping helps to identify the range of actions, alternatives, environmental effects, methods of assessment, and mitigation measures to be analyzed in depth, and eliminate from detailed study those issues that are not important to the decision at hand. This is not a public hearing, however the public may be present and offer comments. If you attend as a member of the public to address an item on the agenda, please let the chairperson know, when discussion begins on that item. Each project will be presented by staff followed by an opportunity for comments for the record.

A. **INTRODUCTION:** Staff, format of meeting

B. **NEW CASES:**

Antelope Valley Water Bank Project EIR – Notice of Preparation
Specific Plan Amendment No. 13, Map 232, Specific Plan Amendment No 2, Map 233; Agricultural Preserve No. 24 - Inclusion (Willow Springs Specific Plan)
Antelope Valley Water Bank by WDS (wo # PP05283)

C. **ADJOURNMENT:**

AMERICANS WITH DISABILITIES ACT
(Government Code Section 54953.2)

Disabled individuals who need special assistance to attend or participate in the scoping meeting may request assistance at the Kern County Planning Department or by calling Patricia White at (661) 862-8637. Every effort will be made to reasonably accommodate individuals with disabilities by making meeting materials available in alternative formats. Requests for assistance should be made five (5) working days in advance whenever possible.

Posted: September 30, 2005
DBK

SUMMARY OF PROCEEDINGS

KERN COUNTY AGENCY SCOPING MEETING

Kern County Planning Department
2700 "M" Street, Suite 100
Bakersfield, California

Conference Room

Date October 4, 2005

ATTENDENCE: Lorelei Oviatt, Senior Planner
Don Kohler, Planner 1

The hearing convened at 1:30 p.m.

Ms. Oviatt explained the purpose of the scoping meeting, the legislation that requires it and the format of the meeting. She pointed out the agendas and sign in sheet at the back of the room. She introduced staff and noted that staff would present each item and ask for comments.

1. **Antelope Valley Water Bank Project EIR – Notice of Preparation**
Specific Plan Amendment No. 13, Map 232, Specific Plan Amendment No 2, Map 233; Agricultural Preserve No. 24 - Inclusion (Willow Springs Specific Plan) Antelope Valley Water Bank by WDS (wo # PP05283)

Ms. Oviatt read the project name, location and description from the Notice of Preparation. She further explained that water banks are a by right use in the A zone, requiring no discretionary action by the county. However, an Environmental Impact Report (EIR) is required for the infrastructure, therefore the EIR will look at the whole of the project. Ms. Sherry Delano of the Rosamond Community Services District offered the following comments and asked the following questions:

- What is an Ag Preserve and how many acres of land would be included under a Williamson Act contract. Ms. Oviatt explained that an Ag Preserve is an administrative function that allows the county to administrate the Williamson Act Program. All property that is under contract falls within an Ag Preserve. 640 acres of land will be under contract for this project.
- Make clear what the 90% withdrawal rate encompasses. Does it take into account the water that evaporates?
- Will there be controls on the amount of water withdrawn when the property is farmed?
- Stated that she feels water banking is a good thing for the Antelope Valley.

Alvin Bautista representing LADWP said they would be providing written comments by October 20th. He then asked for further clarification on the zoning issues involved with the project and when a Draft of the EIR would be available. Ms. Oviatt explained that

the zoning required changing to allow for the infrastructure to be constructed for the water bank, and if all of the property were zoned A, that the project would not have required any action by the county. She also stated that Kern County has a water export ordinance that prohibits export of water out of the county. However, the ordinance specifically excludes water banks from this prohibition. Ms. Oviatt said a DEIR should be available prior to December 31, 2005. She further stated that the FEIR should go before the Board of Supervisors sometime in May.

Ms. Sherry Delano of the Rosamond Community Services District asked if any discretionary actions are required after approval of the SPA. Ms. Oviatt stated that once the Board approves the SPA, no other discretionary approvals would be required. Ms. Delano also asked when the Monitoring Committee would become active. Ms. Oviatt stated that the committee needs to be enforceable and that most likely the format and timing of the committee would become a mitigation measure. Mr. Andrew Werner of Western Development and Storage asked if he could further explain why the committee was being proposed. He stated that modeling of the entire water basin would be very complicated and that the committee was proposed to ensure that surrounding interests were able to participate in the operation of the water bank.

Ms. Oviatt stated that the impacts to the entire basin, including Los Angeles County would be included in the EIR. She also said that growth-inducing concerns would be addressed. There will also be questions that cannot be answered, however they will still be discussed in the EIR.

No other comments were received on the project.

Ms. Oviatt adjourned the meeting at 1:55 p.m.

Lorelei Oviatt, Supervising Planner

DBK

COMMENTS RECEIVED ON THE NOTICE OF PREPARATION

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Arnold
Schwarzenegger
Governor

Sean Walsh
Director

Notice of Preparation

September 20, 2005

To: Reviewing Agencies

Re: Antelope Valley Water Bank Project by Western Development and Storage
SCH# 2005091117

Attached for your review and comment is the Notice of Preparation (NOP) for the Antelope Valley Water Bank Project by Western Development and Storage draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Don Kohler
Kern County Planning Department
2700 M Street, Suite 100
Bakersfield, CA 93301

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Rodriguez for:

Scott Morgan
Senior Planner, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# **2005091117**
Project Title Antelope Valley Water Bank Project by Western Development and Storage
Lead Agency Kern County Planning Department

Type **NOP** Notice of Preparation

Description The applicant, Western Development and Storage, LLC (WDS) is proposing to construct the Antelope Valley Water Bank project. The purpose of the project is to develop a facility to recharge and store imported surface water beneath properties in the west end of the Antelope Valley, California.

Lead Agency Contact

Name Don Kohler
Agency Kern County Planning Department
Phone (661) 862-8787 ***Fax***
email
Address 2700 M Street, Suite 100
City Bakersfield ***State*** CA ***Zip*** 93301

Project Location

County Kern
City
Region
Cross Streets Avenue "A" and 170th Street West
Parcel No. 359-04-01,11,12,17,18
Township 9N ***Range*** 15-14W ***Section*** 25/30, ***Base*** SBB&M

Proximity to:

Highways
Airports
Railways
Waterways
Schools
Land Use Agricultural & Vacant Land/ A (Exclusive AG); E (Estate) & FPS (Flood Plain Secondary) 8-5 (Resource Mgmt); 7-1 (Light Industrial); 5-3 (Residential);4.4 (comprehensive plan area); 2.85 (Military Flight ops) 2-6 (Flood Hazard)

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Archaeologic-Historic; Drainage/Absorption; Flood Plain/Flooding; Geologic/Seismic; Noise; Soil Erosion/Compaction/Grading; Traffic/Circulation; Vegetation; Water Quality; Growth Inducing; Landuse; Cumulative Effects

Reviewing Agencies Resources Agency; Department of Conservation; Office of Historic Preservation; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 4; Department of Health Services; Native American Heritage Commission; California Highway Patrol; Caltrans, District 9; State Water Resources Control Board, Division of Loans and Grants; State Water Resources Control Board, Division of Water Rights; Regional Water Quality Control Bd., Region 6 (Victorville)

Date Received 09/20/2005 ***Start of Review*** 09/20/2005 ***End of Review*** 10/19/2005

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

GSL

County: Kern

SCH# 2005091117

Resources Agency

- [x] **Resources Agency**
  Nadell Gayou
- [ ] **Dept. of Boating & Waterways**
  David Johnson
- [ ] **California Coastal Commission**
  Elizabeth A. Fuchs
- [ ] **Colorado River Board**
  Gerald R. Zimmerman
- [x] **Dept. of Conservation**
  Roseanne Taylor
- [ ] **California Energy Commission**
  Roger Johnson
- [ ] **Dept. of Forestry & Fire Protection**
  Allen Robertson
- [x] **Office of Historic Preservation**
  Wayne Donaldson
- [x] **Dept of Parks & Recreation**
  Environmental Stewardship Section
- [ ] **Reclamation Board**
  DeeDee Jones
- [ ] **S.F. Bay Conservation & Dev't. Comm.**
  Steve McAdam
- [x] **Dept. of Water Resources**
  Resources Agency
  Nadell Gayou
- [ ] ______________
  Conservancy

Fish and Game

- [ ] **Depart. of Fish & Game**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Game Region 1**
  Donald Koch
- [ ] **Fish & Game Region 2**
  Banky Curtis
- [ ] **Fish & Game Region 3**
  Robert Floerke
- [x] **Fish & Game Region 4**
  Mike Mulligan
- [ ] **Fish & Game Region 5**
  Don Chadwick
  Habitat Conservation Program
- [ ] **Fish & Game Region 6**
  Gabrina Gatchel
  Habitat Conservation Program
- [ ] **Fish & Game Region 6 I/M**
  Tammy Allen
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M**
  George Isaac
  Marine Region

Other Departments

- [ ] **Food & Agriculture**
  Steve Shaffer
  Dept. of Food and Agriculture
- [ ] **Depart. of General Services**
  Public School Construction
- [ ] **Dept. of General Services**
  Robert Sleppy
  Environmental Services Section
- [x] **Dept. of Health Services**
  Veronica Rameriz
  Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] **Delta Protection Commission**
  Debby Eddy
- [ ] **Office of Emergency Services**
  Dennis Castrillo
- [ ] **Governor's Office of Planning & Research**
  State Clearinghouse
- [x] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Ken Lewis
- [ ] **State Lands Commission**
  Jean Sarino
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics**
  Sandy Hesnard
- [ ] **Caltrans - Planning**
  Terri Pencovic
- [x] **California Highway Patrol**
  John Olejnik
  Office of Special Projects
- [ ] **Housing & Community Development**
  Lisa Nichols
  Housing Policy Division

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Katherine Eastham
- [ ] **Caltrans, District 4**
  Tim Sable
- [ ] **Caltrans, District 5**
  David Murray
- [ ] **Caltrans, District 6**
  Marc Birnbaum
- [ ] **Caltrans, District 7**
  Cheryl J. Powell
- [ ] **Caltrans, District 8**
  Dan Kopulsky
- [x] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Mario Orso
- [ ] **Caltrans, District 12**
  Bob Joseph

Cal EPA

Air Resources Board

- [ ] Airport Projects
  Jim Lerner
  - [ ] Transportation Projects
    Kurt Karperos
  - [ ] Industrial Projects
    Mike Tollstrup
- [ ] **California Integrated Waste Management Board**
  Sue O'Leary
- [x] **State Water Resources Control Board**
  Jim Hockenberry
  Division of Financial Assistance
- [ ] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [x] **State Water Resouces Control Board**
  Steven Herrera
  Division of Water Rights
- [ ] **Dept. of Toxic Substances Control**
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [ ] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [ ] **RWQCB 4**
  Jonathan Bishop
  Los Angeles Region (4)
- [ ] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [x] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)
- [ ] **Other** ______________

Last Updated on 08/10/05

PALMDALE WATER DISTRICT

2029 East Avenue Q • Palmdale, California 93550 • Telephone (661) 947-4111
Fax (661) 947-8604
www.palmdalewater.org

October 20, 2005

County of Kern
Planning Department
Attn: Mr. Don Kohler
2700 "M" Street
Bakersfield, CA 93301-2323

RE: NOTICE OF PREPARATION OF THE ANTELOPE VALLEY WATER BANK PROJECT ENVIRONMENTAL IMPACT REPORT

Dear Mr. Kohler:

Thank you for the opportunity to review and comment on the "Notice of Preparation of the Antelope Valley Water Bank Project EIR." It appears that the Notice of Preparation is complete and that the Environmental Impact Report prepared for this project will address any potential areas of concern for the Palmdale Water District.

Please contact me at (661) 947-4111, x146, if you have any questions or need any additional information.

Very truly yours,

CURTIS D. PAXTON,
Assistant General Manager

CDP/cdp

Office Memorandum **KERN COUNTY**

To: Planning Department
Don Kohler

Date: November 9, 2005

From: Engineering & Survey Services
Floodplain Management Section
Aaron Leicht

Phone: 862-5094

Subject: NOP; Antelope Valley Water Bank

This Section has reviewed the subject project and recommends that a flood study be prepared in order to identify and mitigate the potential impacts to the floodplain. If a diversion of flood waters result from the proposed floodplain encroachment a Conditional Letter of Map Revision (CLOMR) will be required. If any flood waters are diverted south across Avenue A, a letter from Los Angeles County accepting those waters shall be required.

Department of Water and Power the City of Los Angeles

ANTONIO R. VILLARAIGOSA
Mayor

RONALD F. DEATON, General Manager

October 20, 2005

Mr. Don Kohler
Kern County Planning Department
Public Services Building
2700 M Street, Suite 100
Bakersfield, California 93301-2370

Dear Mr. Kohler:

Subject: Notice of Preparation of the Antelope Valley Water Bank Project Environmental Impact Report

Thank you for the opportunity to comment on the Notice of Preparation (NOP). The Los Angeles Department of Water and Power (LADWP) has reviewed the NOP, dated September 21, 2005, which indicates that Western Development and Storage, LLC will prepare an Environmental Impact Report for a proposed Antelope Valley Water Bank Project. Please consider the following comments when preparing the EIR, specifically in regards to Phase 2 Option A: *Use of the Los Angeles Aqueduct* (LAA).

- The proposed use of the LAA is inconsistent with operations of the aqueduct system. The proposed use contemplates water flowing in the LAA north through the Antelope Valley which is opposite to the normal direction of flow. We are concerned about impacts to operations of the LAA and the City's water supply by the proposed use of our facilities. The LAA is nearing 100 years in service, and requires increasing amounts of maintenance, restricting the periods when it can be in service.

- The proposed use would create water quality impacts to the City's water supply through commingling of our LAA supply with State Water Project water and potentially Antelope Valley groundwater. Without the implementation of additional treatment, the introduction of State Water Project supplies or Antelope Valley groundwater could degrade the quality of LAA supplies.

- LAA supplies from the Owen Valley represent very high quality water with low Total Dissolved Solids. On the other hand, State Water Project supplies are of far inferior quality, with significant levels of organic material that result in the formation of harmful disinfection by-products following

treatment. Without adequate water quality studies and associated bench scale testing, it may not be possible to obtain Department of Health Services permits allowing project water to be introduced into the LAA.

- The introduction of State Water Project transfer water into the LAA to enhance water supply reliability has been contemplated by the City. We are currently bench scale testing required by the Department of Health Services to temporarily modify the LAA Filtration Plant operating permit. This will allow full scale water quality testing to be conducted if State Water Project transfer water is introduced into the LAA: However, as proposed the Antelope Valley Water Bank Project could negatively impact LAA water quality and there appear to be no associated reliability benefits from the project accruing to the City.

- The use of the Los Angeles Aqueduct to convey water to the proposed recharge and recovery facilities would require connections to be constructed to the LAA. Such connections would require an agreement with LADWP. Construction would require the LAA to be shut down. We are therefore not supportive of connections to the Los Angeles Aqueduct.

- The proposed use of the LAA could put the structural integrity of the aqueduct at risk. Structural integrity could be impacted in a variety of ways including surge pressures caused by the proposed pump station, and changing the direction of flows.

For all of these reasons we recommend that Phase 2 Option A: Use of the Los Angeles Aqueduct be eliminated in your proposed EIR.

Sincerely,

Jim B McDaniel

James B. McDaniel
Chief Operating Officer – Water System

DRP:mm

PALMDALE

a place to call home

38300 Sierra Highway

P   lale, CA 93550-4798

Tel: 661/267-5100

Fax: 661/267-5122

TDD: 661/267-5167

October 19, 2005

Mr. Don Kohler
Kern County Planning Department
2700 M Street, Suite 100
Bakersfield, CA 93301

RE: Notice of Preparation of Environmental Impact Report (EIR) for the Antelope Valley Water Bank Project

Dear Mr. Kohler:

Thank you for the opportunity to comment on the Notice of Preparation for the above-named project. The following summarizes the City of Palmdale's comments:

The potential significant impacts outlined in the notice of preparation for this project appear accurate regarding the proposed project. The City of Palmdale would urge the lead agency to consider any adverse impacts due to the proximity of Edwards Air Force Base and the potential for groundwater contamination. Potential impacts to the project based on the proposed re-zone of portions of the area to Exclusive Agriculture, which, according to the County Zoning Ordinance, would permit uses such as irrigated agriculture, dairy and beef cattle grazing and agricultural chemical storage and repackaging should also be considered. There is the potential that these uses, if approved in the vicinity in the future, could significantly affect this project and the environment through discharges from the aquifer or potential contamination to the groundwater. Therefore, the EIR for this project should take into consideration the change in land use and zoning as it specifically relates to the current project.

We are confident that our concerns will be adequately addressed in the proposed EIR. We also request copies of all future correspondence on this project. If you have any questions, please contact Amy Brislen at (661) 267-5200.

Sincerely,

Laurie Lile
Director of Planning

City of Lancaster

44933 Fern Avenue
Lancaster, California 93534-2461
661-723-6000

October 18, 2005

Kern County Planning Department
Attn: Don Kohler
2700 M Street, Suite 100
Bakersfield, California 93301

Subject: **NOTICE OF PREPARATION OF THE ANTELOPE VALLEY WATER BANK PROJECT ENVIRONMENTAL IMPACT REPORT**

Dear Mr. Kohler:

Thank you for sending to the City of Lancaster a copy of the notice of preparation (NOP) for the proposed Antelope Valley Water Bank project and for taking lead agency responsibility for the project. The City of Lancaster is very much in support of the project and sees its implementation as an opportunity to help ensure the availability of water supplies throughout the Antelope Valley.

Generally speaking, the City of Lancaster interposes no objection to the NOP; however, and as listed below, there are four questions or concerns that we feel should be addressed by the Project Environmental Impact Report:

1. Under section 1.6 Project Operations, the leasing of recharge basins for organic farming when the land area is not required for recharge activities sounds like a good financial arrangement but seems to introduce another consumptive use for water. The PEIR should discuss in detail the source and quantity of water to be used for the proposed organic farming.
2. Section 1.8.1 Kern County discusses Ordinance No. G-6502 and specifies that water imported for banking is exempted from the restraints of the ordinance. However, the stipulation that only 90% of the water delivered to the groundwater bank may be recovered seems unscientific and appears to treat up to 10% of the recharged water as native Kern County water since that amount could not be recovered. This should be more scientifically developed and discussed in the PEIR so as not to penalize unnecessarily those who may purchase water for groundwater storage.
3. Section 1.8.3 State Agency Actions or Approvals does not address the probable regulatory oversight that can be expected as it pertains to changes to ambient groundwater quality that may result from the introduction of imported water. The City of

Lancaster believes this to be a condition that could be mitigated, but it cannot be overlooked in the preparation of the PEIR.

4. Under section 1.9 Alternatives to the Proposed Project, we believe a fifth alternative should be considered. The investigation of constructing shallow, subsurface recharge chambers would be appropriate to minimize losses due to evaporation and to reduce bird strike threats that may result from surface impoundments of recharge water.

Should you need clarification on any of the above issues, please contact me at the City of Lancaster at (661) 723-6044.

Sincerely,

James R. Williams

James R. Williams, PE
Public Works Director

JRW/vp

Rosamond Community Services District

September 29, 2005

SENT VIA FAX

Don Kohler, Planner I
Kern County Planning Department
2700 'M' Street, Suite 100
Bakersfield, CA 93301-2323

Subject: Notice of Preparation of the Antelope Valley Water Bank Project Environmental Impact Report

Mr. Kohler:

The District appreciates the opportunity to comment on the proposed project and feel that projects like this one will benefit the Antelope Valley. There are some questions that we would like clarification on and that are attached for your review. Claud Seal and I will be at the Scoping Meeting next Tuesday.

Sherry L. DeLano
General Manager

cc: Claud Seal, Assistant Manager RCSD

Attachment

3179 35th Street West, Rosamond, California 93560
(661) 256-3411 FAX (661) 256-2557
E-mail: rcsd@qnet.com

Memorandum

To: Sherry DeLano, General Manager

From: Claud Seal, Assistant General Manager

Date: 9/29/2005
Re: KERN COUNTY NOTICE OF PREPARATION OF THE ANTELOPE VALLEY WATER BANK PROJECT ENVIRONMENTAL IMPACT REPORT

This memo is in response to Don Kohler's request for review and feedback on the above document. I would like to preface my comments and queries that follow with the statement that I feel this is a step forward in the right direction of water conservation and future wise water usage in the Antelope Valley.

Page 1-10, Section 1.6, paragragh 2: sentence 1 – "dewatered portions." Question: Where are the data proving that the basin had been dewatered? Sentence 2 – "500,000 af." Question: Again, where are the data to substantiate this value?

Page 1-11, Section 1.6, paragraph 2:sentence 3 – "limited to 90%." Question: That figure is based on what source? Is there a development and/or recovery curve?

Page 2-1, Chapter 2, Factors Potentially Affected. Question: Why is not the "Public Services" box not checked? Will new wells need electrical power? Will not access roads be needed? Will the access roads need covering or hard plating to prevent or reduce dust emissions?

Page 2-4, I (c), paragraph 5: "however, current farming practices would remain in the area of recharge basins 8 – 10 month of the year," Question: Will the farming operations include watering the crops using local agricultural wells that will be drawing from the same aquifers that the spreading and percolation water be entering? How will the surface water be accounted for if the farming uses more water than has been infiltrated by spreading?

Page 2-5, II (c), first paragraph: What about new wells being located in new locations on existing farmlands? Will they not need pipelines and roads? Will these new features interfere with the farming operations?

Page 2-12, VI (a), i: In paragraph in the report, the test basins were noted as being outside the fault zone yet in paragraph (ai-aii) the test area is defined by fault zones. Will not the Willow Springs fault allow some of the percolated surface water to flow east, toward Rosamond, or other areas, beyond the project recovery wells?

Page 2-18, VIII (b): First sentence: "depleted aquifer." and second sentence, "Ten percent," Question: Data? Proof?

Page 2-19, (f): Question: Who pays for the surface water for how long? Assuming Western is paying the source surface water bill for initial spreading, at what point is the operation deemed successful and outside water interests begin the commercial water banking process?

End of questions.

DEPARTMENT OF CONSERVATION

DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

4800 STOCKDALE HWY. • STE. 417 • BAKERSFIELD, CALIFORNIA 93309

PHONE 661 / 322-4031 • FAX 661 / 861-0279 • WEB SITE conservation.ca.gov

September 22, 2005

Mr. Don Kohler
Kern County Planning Department
2700 "M" Street, Suite 100
Bakersfield, CA 93301

Subject: SPA 13, Map 232; SPA 2, Map 233
(Western Development & Storage, LLC [PP05283])
Sec. 25 T9N R15W, Sec. 30 &31 T9N R14W SBB&M

Dear Mr. Kohler:

The Department of Conservation's Division of Oil, Gas, and Geothermal Resources (Division) has reviewed the above referenced project. The Division supervises the drilling, maintenance, and plugging and abandonment of oil, gas, and geothermal wells in California. The Division offers the following comments for your consideration.

The proposed project is located beyond the administrative boundaries of any oil or gas field. There are no oil, gas, or injection wells of record within the project boundaries. Regardless, if any abandoned or unrecorded wells are uncovered or damaged during excavation or grading, remedial plugging operations may be required. This office must be contacted to obtain information on the requirements for and approval to perform remedial operations.

Thank you for the opportunity to comment on this project. If you have any questions, please call Tom Giallonardo at the Bakersfield district office: 4800 Stockdale Highway, Suite 417, Bakersfield, CA 93309; phone (661) 334-3663.

Sincerely,

Daniel J. Tuttle

Daniel J. Tuttle
Senior Oil and Gas Engineer

DEPARTMENT OF THE NAVY
NAVAL AIR WARFARE CENTER WEAPONS DIVISION
1 ADMINISTRATION CIRCLE
CHINA LAKE, CA 93555-6100
575 I AVENUE SUITE 1
POINT MUGU, CA 93042-5049

IN REPLY REFER TO:

5090
Ser 52F000E/ 6645
20 Oct 05

Kern County Planning Department
Attn: Don Kohler
2700 M Street, Suite 100
Bakersfield, CA 93301

Dear Mr. Kohler:

Subj: ANTELOPE VALLEY WATER BANK PROJECT ENVIRONMENTAL IMPACT REPORT

Thank you for the opportunity to provide comments on the Notice of Preparation of the Antelope Valley Water Bank Project Environmental Impact Report.

The proposed includes water recharge basins, which have the potential to attract birds. These basins are located underneath several low-level flight corridors and an increase in the number of birds in the area could create a hazard for the military aircraft using those corridors. We request that the potential for increased bird strike hazard to military aircraft be analyzed in the Environmental Impact Report.

If you have any questions or need any additional information, please contact me at (805) 989-9209 or email: Anthony.Parisi@navy.mil.

Sincerely,

A. M. PARISI
Head, Sustainability Office
By direction of the Commander

Copy to:
AFFTC (Dwight Deakin)
NAWS, China Lake (John O'Gara)

Quartz Hill Water District

P.O. Box 3218, Quartz Hill, CA 93586
42141 N. 50th St. West, Quartz Hill, CA 93536
Office: 661-943-3170 • Fax: 661-943-0457
Website: www.qhwd.org

October 20, 2005

Dear Ms. Oviatt and Mr. Kohler,

Quartz Hill Water District has received the Notice of Preparation for the Antelope Valley Water Bank Project Environmental Impact Report. Our District appreciates the opportunity to review the documents and has no comments at this time.

Sincerely,

Dave Meraz
General Manager
Quartz Hill Water District

ENVIRONMENTAL HEALTH SERVICES DEPARTMENT

KERN COUNTY

Office Memorandum

Date: October 20, 2005

To: Ted James, Director
Planning Department
Attention: Don Kohler

From: Steve McCalley, Director
Environmental Health Services Department
By: Thomas Hardy, Environmental Health Specialist III

Re: Notice of Preparation for the Antelope Valley Water Bank Project

The Kern County Environmental Health Services Department has reviewed the subject project. This Department has the local regulatory authority to enforce state regulations and local codes as they relate to waste discharge, water supply requirements, noise, and other items that may affect the health and safety of the public or that may be detrimental to the environment.

The Environmental Health Services Department recommends that the following items be addressed in the EIR for the subject project:

1. All of the water wells which will be drilled for this project must be drilled under permit with the Environmental Health Services Department.

2. Potential impacts to groundwater must be addressed.

3. Noise impacts resultant from this project must be addressed.

TH:

18

Alan C. Lloyd Ph.D.
Agency Secretary

Victorville Office
14440 Civic Drive, Suite 200, Victorville, California 92392-2306
(760) 241-6583 • Fax (760) 241-7308
http://www.waterboards.ca.gov/lahontan

Arnold Schwarzenegger
Governor

October 19, 2005

File: Kern County General - EIR

Don Kohler
Kern County Planning Department
2700 "M" Street, Suite 100
Bakersfield, CA 93301

EVALUATION OF A NOTICE OF PREPARATION FOR THE ANTELOPE VALLEY WATER BANK PROJECT BY WESTERN DEVELOPMENT AND STORAGE, SCH # 2005091117, ANTELOPE VALLEY, KERN COUNTY

Introduction

The Regional Water Quality Control Board staff (Board staff) has reviewed the Notice of Preparation (NOP) for the Antelope Valley Water Bank Project by Western Development and Storage, SCH # 2005091117. The submittal consisted of a Notice of Preparation Letter, Notice of Preparation Distribution List, and Notice of Preparation - Environmental Impact Report (EIR).

Project Background

The proposed project is to construct the Antelope Valley Water Bank project. The purpose of the project is to develop a facility to recharge and store imported surface water beneath properties in the west end of the Antelope Valley, which can later be extracted when needed.

The NOP indicated that the project is designed to:

1. Enhance water supply reliability and flexibility in a cost effective and environmentally sound manner;
2. Reduce groundwater overdraft; and
3. Encourage conjunctive use, where appropriate.

The project is proposed to be constructed in two phases. Phase I would consist of construction of the recharge and recovery facilities, connecting to the Antelope Valley East Kern (AVEK) West Feeder line. Phase II would involve connecting the recharge and recovery facilities to the California Aqueduct, to increase total capacity of the project.

The proposed project will consist of recharge basins on 1,200 – 1,500 acres; with individual recharge basins ranging from 1 – 50 acres each. The surface water from AVEK will be allowed to percolate through the subsurface to be stored in the underlying aquifer. Approximately ten new extraction wells will be combined with the existing 30-40 extraction wells to extract the stored groundwater.

The NOP estimated that construction could commence by the middle of 2006, with extraction of the groundwater occurring approximately one year later. The text indicates that the EIR will consider a wide range of alternatives, including: 1) other locations in or near Antelope Valley; 2) use of injection wells instead of recharge basins; 3) use of surface reservoirs to store imported surface water; and 4) supplying surface water (from aqueducts) to farmers for irrigation, thus resulting in the accumulation of stored groundwater equal to that which would be extracted by pumping for agricultural purposes.

Board staff Comments

The following comments should be incorporated into the preparation of the EIR for Antelope Valley Water Bank project.

1. Section 1.8.3 State Agency Actions or Approvals – The text indicates that the Regional Board will authorize proposed construction activities under the Regional Board's General Permit for Storm Water Discharges associated with Construction Activity. Since there is no surface water in Lancaster, there is no Storm Water permit required. There is no reference to any other permits/waivers that are required by the Regional Board. Additional permits (i.e. Waste Discharge Requirements) may be required by the Regional Board for the recharge of aqueduct water by injection into the subsurface, due to the disinfection products or other constituents that might be present in the aqueduct water, and not in groundwater.

2. The environmental checklists lists the following as potential significant impacts occurring from the project, that will be addressed in the EIR:
   a. Violation of water quality standards or waste discharge requirements;
   b. Substantially altering the existing drainage patterns of the site or area including that alteration of stream or rivers courses;
   c. Substantially degrade water quality; and
   d. Placement within a 100-year flood hazard area, which could impede or redirect flood flows.

Specific Board staff Requests

The following items should be discussed when the EIR is prepared for the Antelope Valley Water Bank Project:

3. Injection of aqueduct water that has been disinfected may contain trihalomethanes (THMs), which would unreasonably affect a water of the State for beneficial use, and constitute a pollution as defined in Section 13050 of the State Water Code. The EIR should provide sufficient information or analysis to determine whether the project will comply with State Board Resolution No. 68-16. State Water Resources Control Board Resolution No. 68-16 "Statement of Policy With Respect to Maintaining High Quality of Waters in California requires:

   "Any activity which produces or may produce a waste or increased volume

or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

4. The EIR should present sufficient data so that Board staff can independently determine if the groundwater quality will be degraded due to the Recharge Project, and may require an anti-degradation analysis.

5. The EIR should estimate the water quality resulting from the injected water with the native groundwater. A complete characterization of the native groundwater vs. the injected water quality should be presented.

6. The proponent for the project will have to prove that this project will: (1) not cause a pollution or nuisance, (2) not unreasonably affect present and anticipated beneficial use of the groundwater, and (3) maintain the highest water quality consistent with the maximum benefit to the people of the State.

7. The EIR should evaluate all significant impacts that are identified and propose appropriate mitigation measures. If these impacts are unavoidable, a Finding of Overriding Consideration needs to be made by the Lead Agency.

8. The EIR should provide information on hydrogeology, groundwater quality and groundwater hydrology. Such information is needed to evaluate the feasibility and potential impacts of the aquifer recharge project. Information needed includes, but is not limited to information on:
   a. Depth to groundwater,
   b. Depth to bedrock,
   c. Direction of groundwater flow,
   d. Existing groundwater quality,
   e. Locations of existing water supply wells (both active and inactive),
   f. Use of wells (agricultural, domestic, stock watering, etc.),
   g. Geologic lithology to depths in excess of 50 feet,
   h. Results of pump tests, and
   i. Soil and aquifer hydraulic conductivity.

9. Waste Discharge Requirements (WDRs) may be required for the discharge of disinfected water by the proposed reinjection to groundwater. As the State agency responsible for regulating the discharge of waste and protecting water quality, the California Regional Water Quality Control Board, Lahontan Region (Regional Board), must ensure that waste discharges do not result in a pollution or nuisance. The project proponent may be required to file a Report of Waste Discharge (RWD) with the Regional Board pursuant to Section 13260 of the California Water Code. Following submittal of a complete RWD, Board staff will prepare tentative WDRs for the project. Board staff will present WDRs

to the Regional Board for adoption within 120 days of receiving a complete RWD. Kern County is the Lead Agency under the California Environmental Quality Act (CEQA). The Regional Board, as Responsible Agency, will rely on the CEQA document prepared by the county.

10. The Discharger and its contractor(s) will be responsible for implementing site-specific temporary soil stabilization, site controls, and re-vegetation construction stability measures. These measures include, but are not limited to:

    - Control of fuel, lubricants, and any hazardous materials stored or used in the project area;
    - Control of wash down discharges from the project site; and
    - Sediment Tracking Control.

Conclusion

Board staff accepts the Notice of Preparation as submitted, and looks forward to reviewing the EIR for the Antelope Valley Water Bank project.

If you have any questions regarding this matter, please telephone me at (760) 241-7366 or Hisam A. Baqai, Supervising Engineer at (760) 241-7325.

Sincerely,

Greg Cash

Greg Cash
Engineering Geologist
South Basin Regulatory Unit

GC\rc\U:\NOP, Antelope Valley Water Bank Project.doc

STATE OF CALIFORNIA – THE RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES

SOUTHERN DISTRICT
770 FAIRMONT AVENUE, SUITE 102
GLENDALE, CA 91203-1035

OCT 20 2005

Mr. Don Kohler
Kern County Planning Department
2700 M Street, Suite 100
Bakersfield, California 93301

Dear Mr. Kohler:

My office has received your agency's *Notice of Preparation of the Antelope Valley Water Bank Project Environmental Impact Report* dated September 21, 2005. In reviewing this Notice of Preparation (NOP), we have the following comments. Prudent groundwater management involves the monitoring and management of groundwater levels, groundwater quality, and inelastic land surface subsidence (e.g., DWR Bulletin 118-2003, Chapter 3). The NOP includes some of these issues within its general scope, however, the explanatory remarks do not specify that all aspects of these issues will be addressed. In addition, there appears to be no provision in the NOP to address water rights in the basin.

Section VIII(b) of the NOP indicates that depletion of "groundwater supplies" and a "lowering of the local groundwater table level" are seen as a less-than-significant impact. The accompanying explanation says that ten percent of the water would be left in the aquifer by the project. However, infiltration of large amounts of water (as much as 100,000 acre feet per year is proposed) will likely raise the water table and change the local groundwater flow pattern. It is possible that the recharged water will flow out from beneath the project area. Subsequent planned extraction of groundwater may result in a lowering of groundwater levels beneath the project area which may produce deleterious effects. We suggest that the EIR address groundwater flow under the planned operating conditions and the effectiveness of extracting the stored water from the project area. Incorporating into the project an array of monitoring wells would help with tracking and evaluating water level changes.

Sections VIII(a) and VIII(f) indicate that the EIR will address water quality issues. Because the explanatory notes mention potential water quality issues only in broad terms, we do not know all of the specific issues that will be addressed. The NOP says that the land involved in this project has historically been under agricultural production. Because California agricultural practices often involve application of fertilizers, herbicides, and pesticides, there is a potential that these contaminants may reside in the zone of aeration beneath the agricultural land. Infiltration of water through recharge

basins and the subsequent rise in the local groundwater surface may leach contaminants into the groundwater.

The water that is infiltrated is likely not to have the same water quality character as the native groundwater in the basin. In addition to potential contamination because of percolation through the zone of aeration, the mixed groundwater is likely to be of different character than either the native groundwater or the State Water Project water. The EIR should address impacts of the project on the quality of the water to be exported as well as on the quality of the groundwater down gradient in the basin.

Land surface subsidence resulting from groundwater extraction has been a problem in parts of the Antelope Valley (e.g. USGS WRI 03-4016). Because this project proposes to extract a significant amount of groundwater from the basin, this project may contribute to further land subsidence in the valley. We suggest that the EIR evaluate the potential for local drawdown of the water table and land subsidence under the proposed operating conditions.

In California, the legal right to bank, extract, and use groundwater is also an important issue. This particular project has important aspects that necessitate a discussion of water rights. This project proposes to extract groundwater potentially for export from the groundwater basin. At present, an adjudication of groundwater extraction rights is in process for portions of the Antelope Valley. The right to extract or bank and extract water for export from the Antelope Valley may be in question now and may be in question as the adjudication process progresses. We suggest that the EIR address groundwater rights in general, the right to export groundwater from the basin, and how an adjudication of groundwater rights might impact the project.

We hope that these comments are helpful in planning for your EIR. If you have any questions about these comments, please contact Tim Ross at (818) 543-4663 or tross@water.ca.gov.

Sincerely,

M. Stuart

Mark Stuart, Chief
Southern District

ANTELOPE ACRES TOWN COUNCIL
8812 West Avenue E-8
Antelope Acres, CA 93536

October 20, 2005

Kern County Planning Department
Ted James, AICP, Director
2700 M Street Suite 100
Bakersfield, CA 93301

RE: Antelope Valley Water Bank
EIR Project

Dear Mr. James:

This letter is in response to your Notice of Preparation dated September 21, 2005 concerning the above project regarding the applicant Western Development and Storage LLC (WDS). The antelope Acres Town Council (AA) has jurisdiction within a close proximity and has some concerns regarding this project. The AA will state our concerns and would appreciate a reply on each of these issues.

Our first issue is how will you make this project safe from children who might wander onto the grounds? What kind of security will you provide to safeguard against injury to children?

Next, how will the effects of this project have on our water table? How will you deal with the over or under draft of the water table in our area?

How will WDS pay for the all damages if their settling ponds break through accident or natural causes resulting in damage to residential and commercial structures?

What about the effect of standing water will have on additional mosquitoes that will likely increase with this project? How will you handle a possible breakout of West Nile Virus due to your project?

What effects will your system have on desert plant life currently growing in the area? What provisions have you made to protect the vegetation?

How will you protect the ground water supply from the aqueduct water that you will be delivering? Will you treat the water prior to its entry into the ground?

Will you have offices at the location and how many employees will be on handle the project? Will you maintain the roads in the area?

Please explain what precautions you have taken in the exposure of this water to dogs, cats, and especially horses? Will you pay for any direct costs that are caused by your company when residents have to go in for treatment of their animals?

Will your water only be sold and delivered in the Antelope Valley? How can we be assured that the majority of water is not sent down to Los Angeles?

What kind of delivery system will be maintained at the site? Will you use storage and pressure tanks? How far, in miles, will your water be pumped to?

How have you prepared for a major earthquake? How will you prevent your system from flooding the local area?

Sincerely,

Vickie L. Nelson
Secretary – Antelope Acres Town Council

VLN:pc

Sundale Mutual Water Company

Post Office Box 551, Lancaster, CA 93584
Phone: (661) 942-2198 Fax: (661) 256-2620

October 19, 2005

Kern County Planning Department
Ted James, AICP, Director
2700 M Street Suite 100
Bakersfield, CA 93301

RE: Antelope Valley Water Bank
EIR Project

Dear Mr. James:

This letter is in response to your Notice of Preparation dated September 21, 2005 concerning the above project regarding the applicant Western Development and Storage LLC (WDS). Sundale Mutual Water Company (Sundale) operates a water company within a close proximity and has some concerns regarding this project and the potential impact it will have on delivery of water. I will state our concerns and would appreciate a reply on each of these issues.

Our first issue is the effects this project will have on our water table. If the water table drops from our current level and we can prove that WDS is the main cause, will they pay Sundale for this usage? Will they charge us for water if the water table rises and can prove the water came from their system?

Next, will they pay for the all damages if their settling ponds break through accident or natural causes resulting in damage to residential and commercial structures?

How will you make this project safe from children who might wander onto the grounds? What kind of security will you provide to safeguard against injury to children?

What effects will your system have on desert plant life currently growing in the area? What provisions have you made to protect the vegetation?

How will you protect the ground water supply from the aqueduct water that you will be delivering? Will you treat the water prior to its entry into the ground?

What about the effect of standing water will have on additional mosquitoes that will likely increase with this project? How will you handle a possible breakout of West Nile Virus due to your project?

Please explain what precautions you have taken in the exposure of this water to dogs, cats, and especially horses? Will you pay for any direct costs that are caused by your company when residents have to go in for treatment of their animals?

What kind of delivery system will be maintained at the site? Will you use storage and pressure tanks? How far, in miles, will your water be pumped to?

How have you prepared for a major earthquake? How will you prevent your system from flooding the local area?

Will you have offices at the location and how many employees will be on handle the project? Will you maintain the roads in the area?

Will your water only be sold and delivered in the Antelope Valley? How can we be assured that the majority of water is not sent down to Los Angeles?

Sincerely,

Bruce E. Nelson – President
Sundale Mutual Water Company

BEN:pc

-----Original Message-----
From: Arthur D Unger [mailto:alunger@juno.com]
Sent: Tuesday, October 04, 2005 3:23 PM
To: KohlerD@co.kern.ca.us
Subject: Antelope Valley Water Bank Notice of Preparation

Dear Mr. Kohler,

The DEIR should answer all below questions.

California now has a water shortage and will never again have enough water. Farmers already complain of their water bill and it will be a long time before California's population decreases.

The DEIR should consider the value of taking water from northern California to be used in the Antelope Valley. How much water will be evaporated from the canals between the place the water originates and the water bank? What is the dollar value of the crops to be raised in the Antelope Valley, compared to the dollar value of crops that could be raised if the water was used closer to its origin? Are there crops that have significant non-monetary value and can best be raised in the Antelope Valley? Would people living in more compact northern California communities use less water than people in the Antelope Valley?

I assume all the water that flows off the nearby mountains already contributes to the ground water and that catching that water in a water bank is useless.

Semi-Tropic WSD uses solar electricity to pump water and so should this water bank. The price of solar panels should decrease as more solar is installed on roofs in Bakersfield and throughout California and the world. Please note the agreements between the Sierra Club and developers in metropolitan Bakersfield which call for solar panels to be installed on the first model home of sixteen projects. The price of propane and other fossil fuels will increase.

Thank you for the opportunity to comment,
Arthur Unger
2815 La Cresta Drive
Bakersfield, CA 93305-1719
(661) 323 5569
alunger@juno.com preferred

SUMMARY OF PROCEEDINGS

KERN COUNTY AGENCY SCOPING MEETING

Kern County Planning Department
2700 "M" Street, Suite 100
Bakersfield, California

Conference Room

Date October 4, 2005

ATTENDENCE: Lorelei Oviatt, Senior Planner
Don Kohler, Planner 1

The hearing convened at 1:30 p.m.

Ms. Oviatt explained the purpose of the scoping meeting, the legislation that requires it and the format of the meeting. She pointed out the agendas and sign in sheet at the back of the room. She introduced staff and noted that staff would present each item and ask for comments.

1. Antelope Valley Water Bank Project EIR – Notice of Preparation

Specific Plan Amendment No. 13, Map 232, Specific Plan Amendment No 2, Map 233; Agricultural Preserve No. 24 - Inclusion (Willow Springs Specific Plan) Antelope Valley Water Bank by WDS (wo # PP05283)

Ms. Oviatt read the project name, location and description from the Notice of Preparation. She further explained that water banks are a by right use in the A zone, requiring no discretionary action by the county. However, an Environmental Impact Report (EIR) is required for the infrastructure, therefore the EIR will look at the whole of the project. Ms. Sherry Delano of the Rosamond Community Services District offered the following comments and asked the following questions:

- What is an Ag Preserve and how many acres of land would be included under a Williamson Act contract. Ms. Oviatt explained that an Ag Preserve is an administrative function that allows the county to administrate the Williamson Act Program. All property that is under contract falls within an Ag Preserve. 640 acres of land will be under contract for this project.
- Make clear what the 90% withdrawal rate encompasses. Does it take into account the water that evaporates?
- Will there be controls on the amount of water withdrawn when the property is farmed?
- Stated that she feels water banking is a good thing for the Antelope Valley.

Alvin Bautista representing LADWP said they would be providing written comments by October 20th. He then asked for further clarification on the zoning issues involved with the project and when a Draft of the EIR would be available. Ms. Oviatt explained that

the zoning required changing to allow for the infrastructure to be constructed for the water bank, and if all of the property were zoned A, that the project would not have required any action by the county. She also stated that Kern County has a water export ordinance that prohibits export of water out of the county. However, the ordinance specifically excludes water banks from this prohibition. Ms. Oviatt said a DEIR should be available prior to December 31, 2005. She further stated that the FEIR should go before the Board of Supervisors sometime in May.

Ms. Sherry Delano of the Rosamond Community Services District asked if any discretionary actions are required after approval of the SPA. Ms. Oviatt stated that once the Board approves the SPA, no other discretionary approvals would be required. Ms. Delano also asked when the Monitoring Committee would become active. Ms. Oviatt stated that the committee needs to be enforceable and that most likely the format and timing of the committee would become a mitigation measure. Mr. Andrew Werner of Western Development and Storage asked if he could further explain why the committee was being proposed. He stated that modeling of the entire water basin would be very complicated and that the committee was proposed to ensure that surrounding interests were able to participate in the operation of the water bank.

Ms. Oviatt stated that the impacts to the entire basin, including Los Angeles County would be included in the EIR. She also said that growth-inducing concerns would be addressed. There will also be questions that cannot be answered, however they will still be discussed in the EIR.

No other comments were received on the project.

Ms. Oviatt adjourned the meeting at 1:55 p.m.

Lorelei Oviatt, Supervising Planner

DBK

Appendix B
Feasibility Evaluation

Water Banking Feasibility Evaluation

Antelope Valley Water Bank

January 2005

5700 Wilshire Blvd., Ste 330
Los Angeles, CA 90036
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Executive Summary

This report presents methods, conclusions and recommendations regarding the feasibility of developing a groundwater recharge, storage and recovery facility ("water bank") in the Neenach Sub-Basin of the west end of the Antelope Valley in Kern County, California. This report and underlying work have been prepared by Western Development and Storage, LLC (WDS, Los Angeles, CA) to help water agencies determine if the Project deserves further consideration.

In late 2001 WDS set out to identify the optimum location for a water bank to serve the needs of Antelope Valley and Southern California. WDS performed the search through a geographic information system (GIS) based process that included over 30 criteria. By early 2002, WDS had identified a 400 square mile area in the west end of the Antelope Valley as optimum from a conveyance and operational cost perspective. WDS compiled existing work and quickly realized that while water banking appeared feasible from a regional perspective, there was actually very little site specific data to validate the concept. Therefore, WDS contacted land owners and began field work in 2002. The WDS investigation has included trenching, percolation tests, soil analyses, groundwater analyses, deep borings and geophysical logging followed by hydrogeologic and financial modeling.

Using new and existing data, WDS selected 1,629 acres of farm land that could support pond-based recharge rates of at least 100,000 acre-feet per year (AF/year). The underlying dewatered aquifer has more than 500,000 AF of available storage space and is hydrogeologically isolated from large pumping centers to the east. Groundwater quality is excellent and there are no known sources of contamination.

WDS has spoken with surrounding land owners and no opposition to the concept has been voiced. As part of the screening process WDS selected farmland that has been irrigated with a combination of groundwater and imported surface water from the Antelope Valley East Kern Water Agency (AVEK) as provided through the State Water Project (SWP). As a consequence, WDS anticipates that requirements to comply with the California Environmental Quality Act (CEQA) would be relatively straightforward, with few (if any) issues relating to protection of habitats or wildlife. While it might be possible to entitle the Project through a CEQA Initial Study and Negative Declaration, WDS has conservatively assumed that a full CEQA Environmental Impact Report (EIR) would be required to ensure that all stakeholders have had an opportunity to participate in conceptualization of the Project. WDS has not identified any federal actions or permissions that would necessitate a National Environmental Protection Act (NEPA) Environmental Impact Study (EIS).

The water bank could be configured in a variety of ways, potentially including in-lieu systems and existing wells to reduce pond areas and number of new wells. However, in order to conservatively evaluate economic viability, the most expensive configuration was assumed. WDS estimates that up to $44.1 million would be required to construct the facilities with recharge costs averaging $4/AF and recovery costs averaging $37/AF (not including debt service). The Project was compared to other recent water banking efforts on a present value basis (30-years, 6% cost of capital) with the following results.

Table 1: Present Value Comparison of Water Banking Projects

Project	CAPEX and Land Acquisition ($)	Total Storage (AF)	Capacity (AF/yr)	CAPEX Per AF of Annual Capacity ($/AF)	Put OPEX ($/AF)	Take OPEX ($/AF)	Inactive OPEX ($/AF)	PV ($/AF)
Antelope Valley	**$58,829,333**	**500,000**	**100,000**	**$588**	**$4**	**$37**	**$8**	**$811**
Chino Basin - MWD	$28,200,000	100,000	33,000	$855	$20	$50	$2	$1,185
Semitropic New Unit	$150,000,000	450,000	150,000	$1,000	$25	$25	$2	$1,239
Cawelo proposed to Castaic Lake WA	$15,000,000	120,000	20,000	$750	$0	$200	$0	$1,668
Fresno ID Walden Pond for City of Fresno (marketable capacity)	$12,230,144	NA	8,100	$1,510	$4	$41	$2	$1,726
MID: Phase 1 (marketable)	$63,980,618	117,000	39,000	$1,641	$4	$41	$2	$1,856
Semitropic Existing Unit (firm capacities cited)	$135,000,000	1,000,000	90,000	$1,500	$44	$44	$2	$1,917
Kern Delta - MWD		250,000	50,000	NA	$145	$185	$105	$1,996
Friant: Alternate cost of water purchases absent storage	NA	NA	NA	NA	NA	NA	NA	$2,320
West Coast and Central Basin Pumping Rights	$58,583,350	16,643	16,643	$3,520	$0	$25	$0	$3,635
Terminus Dam	$37,000,000		8,000	$4,625	$0	$0	$0	$4,625
Kaweah Delta	$1,201,336	246	246	$4,883	$0	$0	$0	$4,883
Fine Gold Creek Offstream Storage	$503,000,000		42,000	$11,976	$0	$0	$0	$11,976

Notes

1. Assumes no grants
2. Assumes a 6% cost of capital over 30-years for debt service
3. Does not include permitting (to ensure a valid comparison)
4. Values in red are not known and were assumed low or zero to ensure that the comparison is conservative
5. Assumes recharge 33% of the years, recovery 33% of the years and inactive 33% of the years.

As indicated above, WDS estimates that the Antelope Valley water bank would be the most economical of all projects reviewed. This is not a surprise as WDS included economic criteria in the original site selection process.

In summary, WDS has not identified any fatal flaws and has concluded that the Antelope Valley Water Bank would be an economically viable project. No federal permitting requirements have been identified and CEQA compliance would likely be straightforward. However, water banks by their nature require close coordination between the operating agency, nearby agencies and surrounding land owners to ensure that rights and water uses are protected. There are numerous proven templates for how this coordination can take place.

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Table 2: Summary of Findings

Issue	Findings
Fatal flaw summary	WDS has not identified any fatal flaws.
Outstanding issues	A lead agency is required.
Recharge, storage and recovery capabilities	The target area could support over 100,000 AF per year of recharge, over 500,000 AF storage and 100,000 AF per year of recovery through a recharge pond and recovery well based water bank. WDS estimates are consistent with those by others.
Project costs	Permitting costs: \$3.2 to \$7.1 million (conservative) Capital costs (not including land): \$44.1 million (conservative) *Note: WDS has secured the required land.*
Comparables analysis	40% to 240% less expensive than comparable projects on a per acre-foot basis.
Permitting and contracting time frame	2- to 5-years depending on the drive and consensus of the lead agency and stakeholders.
Permitting requirements	Likely an EIR, wheeling agreements with AVEK, LADWP and DWR, various secondary County and Water Quality Control Board permissions relating to construction. No Federal requirements or Department of Fish & Game permits.
Potential facility configurations	A variety of configurations are possible. WDS evaluated a facility with connections to the Los Angeles Aqueduct, the California Aqueduct and the AVEK West Feeder. Through this configuration the facility could serve any State Water Project contractor either directly or through exchange.
Conveyance capacity	There is sufficient conveyance capacity in the Los Angeles Aqueduct and the AVEK West Feeder to support this project assuming that wheeling agreements can be reached.
Groundwater quality	Groundwater quality is excellent. No contaminants or Title 22 parameter exceedances were detected. Locals drink water directly from irrigation wells.
Hydrogeology	Sand and gravel from the surface to the water table with minor, discontinuous silts and clays. Target area bounded by 3 faults that would prevent stored water migration into the intense pumping areas of the Lancaster Sub-Basin.
Land uses and environmental liabilities	The target parcels and surrounding land are rural and have been farmed since at least 1960. There are no nearby industrial facilities or other known sources of contamination. There are no known past or current underground tanks at the target parcels and, with the exception of one household trash pit, there are no known environmental conditions that would impact groundwater beyond normal farming practices.
Jurisdictional boundaries and zoning	The target parcels are in an unincorporated area of Kern County within the AVEK service area. The target parcels are Zone A Exclusive Agriculture. Water banking is permitted within this zone.
Leases and contracts	The land is currently leased to Peter Rabbit Farms. 640-acres are encumbered with Williamson Act contracts. The County may consider alternation of water banking and farming to be compatible with the Act – thus avoiding cancellation fees and higher taxes.
Existing facilities	The target properties are served by 10-wells and 4.5-miles of irrigation piping connected to the AVEK West Feeder.
Biological resources	The target parcels have been in agricultural use since at least 1960. A review of the California Natural Diversity Database indicated that there are no Federal or California endangered or threatened species in the target area. There are no wetlands or perennial streams on or near the target parcels.
Storage rights	A detailed review of case history and regulations indicates that the Project would have the right to storage space as long as it owns the overlying land. Case law clearly indicates that available storage space would not be limited to that immediately beneath the property.

Introduction

This report presents methods, conclusions and recommendations regarding the feasibility of developing a groundwater recharge, storage and recovery facility ("water bank") in the Neenach Sub-Basin near the west end of the Antelope Valley in Kern County, California. This report and underlying work have been prepared by Western Development and Storage, LLC (WDS, Los Angeles, CA) to help water agencies determine if the Project deserves further consideration.

The term water banking is applied to a wide variety of projects that include the following:

- *Aquifer Storage and Recovery (ASR):* These projects typically entail recharge of surface water through ponds or injection wells for recovery at a later date. The Projects are also called groundwater banking projects;

- *Conjunctive Use and In-lieu Banking*: The Projects include a wide variety of configurations, but typically entail use of surface water in wet years in-lieu of groundwater pumpage – thus banking an equivalent amount of groundwater in the aquifer for use in dry years. Conjunctive use and ASR projects are commonly integrated;

- *Groundwater Pumpage Deferral*: These are short-term programs in which the owner of groundwater rights in an adjudicated basin defers extraction and builds up a "credit" volume that can be sold to other parties. Carry-over credits usually expire within 1 to 5 years;

- *Dry Year Option Programs*: These projects do not physically store water; rather the owner of water rights accepts annual payments for the right to divert water to a buyer in dry years in-lieu of local use (typically for irrigation, such as the 2003 rice fallowing programs);

- *Subsidized Water Conservation*: In many cases farmers are not able to financially justify installation of water conservation systems (i.e. drip irrigation) solely for agricultural reasons. Therefore an entity seeking water can finance the conservation projects to improve agricultural operations and make water available for transfer; and

- *Carry-Over Storage in Reservoirs*: The majority of reservoirs are controlled by public agencies such as the Bureau of Reclamation, the Corp of Engineers, the California Department of Water Resources and a select list of large water utilities such as the Metropolitan Water District of Southern California (MWD). These agencies manipulate storage capacity for their own purposes and rarely make carry-over storage available to 3rd parties. However other water banking efforts that can work in conjunction with surface water reservoirs are highly sought after.

This evaluation was performed to determine the feasibility of a recharge pond based ASR project in the west end of the Antelope Valley in Kern County, California. Within this report, the term "water bank" refers to this type of configuration unless otherwise indicated.

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Regional Need

The need for additional water storage south of the Delta is widely recognized by all stakeholders in California water. The California Department of Water Resources (DWR) estimates that California's population will increase by 17 million by 2030 and be accompanied by increased water demand of 3.5 to 6.0 million acre-feet/year (AF/year) in normal years. In total, the DWR estimates that $75 billion would needed to secure the required water supplies. In order to prioritize projects, DWR has developed a near-term list of project types that need to be accomplished by 2010.

Regarding storage, under current conditions, the DWR has found the state extracts 5.8 million AF from storage in normal years and 14.4 million AF in dry years. These extractions are only partially offset by an addition of 5.4 million AF/year of water back into storage in wet years. Conservatively assuming 40%, 40% and 20% frequencies of wet, normal and dry years, the state has an average annual storage deficit of 3 million AF/year. It is WDS's belief that there is really a need for 9-12 million AF/year of storage capacity because wet year water is usually only available during a 3-4 month window from February through May.

The DWR has performed an inventory of groundwater and surface water storage projects and performed an assessment of their likelihood for implementation (along with a variety of other water projects). The DRAFT results of this inventory indicate the following:

- The DWR has been able to identify 500,000 AF/year of groundwater storage projects that could be implemented by 2010 (Antelope Valley is not included because it has not yet been officially sponsored by an agency) for an estimated capital cost of $1.3 billion ($2,600/AF of annual capacity);
- The DWR did not identify any surface water storage projects that could be reasonably completed by 2010;
- The DWR identified another 1 million AF/year of groundwater storage projects that could be implemented by 2030; and
- The DWR identified 400,000 to 1 million AF/year of surface water storage projects that could be completed by 2030 for $2.9 to $5.7 billion ($7,250/AF to $5,700/AF of annual capacity).

Taken together, DWR has only been able to identify sufficient projects to meet 4% to 17% of the current storage deficit by 2010 (500,000 AF/year divided by 3-12 million AF/year) and sufficient projects to meet to 16% to 83% of the current storage deficit by 2030 (1.9 to 2.5 million AF/year divided by 3-12 million AF/year). The State has specified a preference for groundwater storage over surface water reservoirs. This is because groundwater storage is considered more economical with a reduced environmental impact. In order to "jump start" groundwater storage projects, the State allocated $200 MM to the Proposition 13 grant fund. That fund was used by public entities to study and build groundwater storage facilities. In addition, the State has allocated $500 MM to the Proposition 50 grant fund for similar projects. Examples of regional entities that are actively seeking additional storage include the following:

- State Water Project (SWP) Contractors;
    - Metropolitan Water District of Southern California (MWD);
    - Castaic Lake Water Agency (CLWA);
- Water Retailers;
    - Los Angeles Department of Water and Power (LADWP);
    - Irvine Ranch Water District (IRWD);
    - Santa Margarita Water District (SMWD);
    - American States Water Company (ASW);
    - Southwest Water Company (SWWC);
- Southern California Real Estate Developers;
    - Irvine Ranch;
    - Tejon Ranch;
    - Rancho Mission Viejo ;
- The California Department of Water Resources and CALFED Environmental Water Account (EWA);
- Environmental Organizations such as The Nature Conservancy (TNC); and
- The State of Nevada.

CALFED and DWR

The CALFED Bay-Delta Program EWA requires that Central Valley Project contractors purchase water to increase Delta flows for ecosystem restoration in accordance with Section 3406(d) of the Central Valley Project Improvement Act (CVPIA). CALFED has called for between 500,000 and 1,000,000 AF of new annual yield through groundwater storage projects. To date, CALFED has made investments that may create 110,000 AF of new annual yield leaving a substantial deficit.

Metropolitan Water District Member Agencies

MWD is the regional wholesaler that provides water to over 17 million people in Southern California. Several of MWD's member agencies have expressed a concern that the MWD supply is not completely reliable and are seeking their own backup water supplies through groundwater storage opportunities. One of these agencies, LADWP, receives water supplies from MWD, but also has its own imported sources that are delivered via the Los Angeles Aqueduct (LAA – 2 barrels). The Project is strategically located near LAA barrel #2 (LAA#2). LADWP has expressed interest in the Project and currently requires mitigation water which could be exchanged to the Owens Valley.

SWP Contractors

Because the Project is located near the East Branch of the SWP California Aqueduct (California Aqueduct), there is an opportunity for any of the 28 State Water Contractors to use the Project to firm up their interruptible, drought susceptible supplies.

Real Estate Developers

Residential, commercial and industrial real estate developers must demonstrate back-up water supplies before they are granted development permits. The Costa (SB 610) and Kuehl (SB 221) Bills, which became California Law on January 1, 2002, require that any development over 500 homes (or using an equivalent amount of water) must have a firm verified supply for a minimum of 20 years at the Specific Plan and Tentative Map phase of

development. Several large housing projects including Newhall Ranch in Santa Clarita, the Orcutt Project in Santa Maria, and Gateway Village in Madera had stalled because there was insufficient storage capacity to "bank" their back-up water. These projects turned to a combination of surface water supplies and groundwater banking to solve this problem.

Environmental Organizations

Organizations, such as TNC, could use the water bank to provide water for in-stream uses for fisheries and riparian habitats (through exchange).

Local Need

As with all water storage systems, the main purpose of groundwater banking is to convert fluctuating water availability into a steady supply which is available when needed. Water is stored when there is excess and then recovered when demand outstrips supply. Local entities that have indicated a need for this regulating ability include the following:

- SWP Contractors;
  - Antelope Valley East Kern Water Agency (AVEK);
  - Palmdale Water District (PWD);
  - Littlerock Creek Irrigation District (LCID);
- Retail Water Purveyors;
  - Los Angeles Department of Public Works (LADPW);
  - Rosamond Community Services District (RCSD);
  - Quartz Hill Water District (QHWD);
- Real Estate Developers and Builders;
  - SunCal Companies;
  - Empire Capital;
  - KB Home;
  - Pulte Home;
- Farmers;
  - Diamond Farming Company; and
  - Bolthouse Farms.

Antelope Valley's population, housing demand and water consumption are growing at a rapid pace and there are disputes between farmers and retail water purveyors over the availability of groundwater. After numerous meetings with various entities, WDS believes that the responsibility for water supply reliability would be shared by the following stakeholders.

AVEK

AVEK holds an entitlement to 141,000 AF of SWP surface water supplies. AVEK acts purely as a water wholesaler in that it imports and resells water to local purveyors. AVEK has turned away 30,000 to 45,000 AF/yr for the past three years. This water could have been stored in a water bank.

PWD and LCID

Both of these entities are State Water Contractors and also water purveyors (retailers) that deliver to municipal and agricultural end users. These agencies also pump groundwater.

Farming Community

Farmers in the Antelope Valley use primarily groundwater but also purchase some surface water for irrigation. Some farmers feel that their groundwater pumping costs have increased (or would increase) due to growing groundwater usage by urban water agencies. In 1999 W.M. Bolthouse Farms, Inc. (Bolthouse) and Diamond Farming Company (Diamond) initiated lawsuits against various municipal groundwater pumpers within the Antelope Valley claiming that their ability to pump groundwater in a cost effective manner was being impaired due to increased pumping by municipal users (which was lowering the groundwater table). The lawsuit has continued without resolution.

LADPW, RCSD, QHWD and other Retailers which receive AVEK water

These agencies are purely water retailers which receive surface supplies from AVEK and also pump groundwater to meet the needs of their customers. In July 2004 LADPW, the largest water retailer in the Antelope Valley, indicated that it could no longer issue will-serve letters for new development and also rescinded certain previously issued will-serve letters. These actions immediately halted various real estate development initiatives.

The lack of will-serve letters was a catalyst to raise the real estate development community's interest in a reliable water supply for the Antelope Valley. Furthermore, LADPW has hastened its drive to resolve the water supply reliability problem. This is also true for other local water purveyors and real estate developers that operate within the Antelope Valley. These entities recognize the need for local water banking and understand how it can enhance the water supply portfolio to meet the needs of new growth in the area.

In September 2004 LADPW filed a cross-complaint against the Bolthouse/Diamond lawsuit seeking to quantify the rights to groundwater in the Antelope Valley, which is essentially a call for adjudication. Adjudication is the legal process that allocates the right to produce water from the available natural groundwater supply. All groundwater pumpers within the basin are named in the lawsuit. These actions indicate that there is a finite amount of groundwater within the Antelope Valley which is already being overextended. A partial answer to this issue is the optimization of surface water supplies through storage to reduce groundwater pumpage.

Real Estate Developers

The real estate development community requires will-serve letters from their water retailers in order to permit new housing developments and their efforts have been stalled due to the various issues summarized in previous sections.

WDS Analysis of the Situation

WDS has held numerous meetings with the various stakeholders within the Antelope Valley and believes that all parties understand the responsibilities and benefits of developing a local water banking facility. Because PWD and LCID are independent entities responsible for both the wholesale and retail aspect of their operations, they are solely responsible for their water supply reliability and are interested in participating in the development of such a facility. The situation is more complicated for AVEK and its wholesale water customers.

AVEK is the only pure water wholesaler within the Antelope Valley. The purpose of this organization is to import SWP water and deliver it to its wholesaler customers. Tension exists between AVEK and its wholesale customers regarding how the responsibility of assuring water supply reliability is allocated between AVEK and the retailers. This tension has been aggravated by LADPW's current inability to issue will-serve letters. While both parties recognize water banking as a means to reestablish LADPW's reliability, they are unclear as to how to share the responsibilities moving forward. This issue has caused AVEK and LADPW to sit down together and work towards expediting an agreeable solution. The outcome would likely establish how AVEK's other customers would work with AVEK regarding this same issue. Ultimately, a water bank could be used to store water supplies which AVEK cannot currently take due to the fact that the timing of delivery does not match the timing of demand. WDS believes that the Project could be developed in parallel with any adjudication process because the Project would store surface water only and therefore would not be subject to any limitations on groundwater supplies imposed by adjudication.

Objectives and Limitations

WDS' objectives for this evaluation were as follows:

- Based on existing information and technical/regulatory/economic criteria, select the area best suited for a water bank to serve the Antelope Valley and Southern California;
- Using screening investigations, select parcels that best meet selection criteria;
- Provide preliminary estimates of recharge, storage and recovery capacities;
- Provide preliminary estimates of permitting requirements;
- Provide preliminary estimates of capital costs (CAPEX) and operating costs (OPEX);
- Perform a comparables analysis to other existing and planned water banks;
- Identify fatal flaws, if any; and
- Assuming no fatal flaws, recommend the scope of further work.

It is important to note that while WDS has performed a significant amount of work to determine feasibility; additional investigations would be required to adequately fulfill the needs of permitting and engineering design. Therefore, all WDS estimates presented in this report should be considered preliminary, subject to change upon additional investigation.

Team

WDS is a water resource development firm that identifies, finances and develops water banking and water transfer projects – typically in coordination with public agencies such as Semitropic Water Storage District (Semitropic), IRWD, Madera Irrigation District and Butte Water District. Details of other WDS projects are provided in Appendix A.

The WDS team for this project is summarized on the following table.

Table 3: WDS Team

Team Member	Duties	Education	Years
David Freeman	Political/Regulatory	*Georgia Tech, U. of TN Law School*	50
Noted "Power Czar". Former Chair of the CA Consumer Power and Conservation Financing Authority. Former GM of LADWP, Former Chairman of the Board at the Tennessee Valley Authority, Former GM of SMUD.			
D. Cole Frates	Development/Transfers	*Oklahoma University, John Hopkins*	10
Has negotiated numerous water contracts with developers, power companies and governments including Reliant, Enron, Argentina, Cyprus, Los Angeles and other municipalities throughout California.			
Ari Swiller	Political/Financial	*Cornell*	12
Has vast experience in political and regulatory strategy as well as an investment background performing financial analysis and raising capital.			
Dave Dorrance, PE	Technical/Management	*Colorado School of Mines, U. of Arizona*	22
Has performed hundreds of groundwater, aqueduct, permitting, water rights, design, construction, and projects throughout California, the United States and South America.			
Andrew Werner	Real Estate/Market Analysis	*Virginia Polytechnic & State U.*	10
A hydrogeologist, former Chief Water Analyst at Global Resource Investments and co-founder of Group Triton; an advisory firm specializing in managing water related investments.			
Charlie M. Stringer	Legal/Policy/Regulatory	*Harvard, U. of MN, Gustavus Adolphus*	15
Natural resources and environmental attorney formerly with the EPA & various tribes.			
Douglas Boxer	Government Affairs	U. of CA Berkley, U of San Francisco	20
Various Federal and State level positions in cabinet level departments followed by political consultancy for a variety of large corporations including The Walt Disney Company, Ralph's Grocery Company and Chambers, Dunhill & Rubin.			

NOTE – US Representative Jim Costa left the WDS team in October 2005 after two years of service and just prior to his election to office. Jim Costa is a former California Senator and Assemblyman with 24 years of service. He was a leader in the state legislature on issues concerning water, agriculture, transportation, housing and the unique problems of the San Joaquin Valley.

Field investigations were performed by Layne Christensen Company (Layne, Fontana, CA).

Methods and Chronology

WDS methods and work are summarized in the following sub-sections.

Site Selection Criteria

The locations of most water banks are defined by the geography of agencies and the land available to them. WDS approached this project by defining the criteria that are associated with successful water banks and setting out to find the region where all of these criteria could be fulfilled. The major criteria used by WDS are summarized on the following table.

Table 4: Site Selection Criteria

Criterion	Target Area
Hydrogeologic Criteria	
Sandy near surface soils (0-15 feet below ground surface, bgs) with an average vertical saturated hydraulic conductivity of at least 0.5 feet/day.	WDS estimates an average of >1 foot/day
No significant, laterally continuous hardpan, silts or clays between the surface and the current water table	Three continuously logged borings to 400+ feet, bgs and 17 trenches did not encounter significant low permeability layers above the water table.
Current water table at least 200 feet, bgs. At least 100 feet	Prior to commencement of farming in the early

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Criterion	Target Area
of dewatered aquifer space for water storage. Depth to groundwater stable or increasing over time.	1900's the water table was less than 150 feet, bgs. Water levels dropped to 325 feet, bgs by the early 1970s and have since stabilized at 340 feet, bgs due to farmer use of AVEK surface water commencing in the mid-1970s. Seasonal water table fluctuations are currently less than 10 feet/year.
At least 300,000 AF of available storage space	WDS estimates an availability of at least 500,000 AF of storage space
The portion of the aquifer in which water is to be stored should be isolated hydrogeologically from large urban pumping centers	The target area is within the Neenach Sub-Basin, which is bounded on 3-sides by faults, 10-miles west of Rosamond, 17-miles northwest of Lancaster and 23-miles northwest of Palmdale.
Average well yields of at least 1,000 gpm	Farmers indicate that wells have yields ranging from 1,000 to 2,000 gpm with an average of 1,500 gpm. Higher yields are likely with efficient wells tapping shallow banked water.
No California Title 22 water quality criteria or USEPA Maximum Contaminant Level exceedances in groundwater	Six groundwater samples indicate no water quality criteria exceedances and no detected organic contaminants.
No significant leachable salts remaining in soils (ie long term irrigation has already leached most salts)	The target parcels have been irrigated since at least 1960 and Soil Conservation Service (SCS) data indicate extremely low leachable salt content in soils.
Water Availability Criteria	
At least 2 available water sources	The target area can receive SWP water from the California Aqueduct or Owens Valley water from LAA#2.
No California Title 22 water quality criteria or USEPA Maximum Contaminant Level exceedances in source water	SWP water meets quality criteria. Owens Valley water has historically contained arsenic, but levels are now less than 10 ug/l, commonly less than 5 ug/l.
A history of having used the source surface water locally for irrigation purposes with no adverse impact to native groundwater.	SWP water has been used to irrigate the target parcels (and surrounding farms) since 1974 with no degradation of groundwater quality.
Water available over at least 4-months in wet years	Water is available year-round.
Location and Conveyance Criteria	
South of the Bay-Delta	The target parcels are south of the Delta
Within the service area of a water agency with responsibility for delivering surface water supplies	The target parcels are within the service area of AVEK.
Uphill of the Edmonston Pumping Plant to take advantage of off-peak pumping costs when available	The target parcels are uphill of Edmonston pumping plant.
Topographically lower than conveyances used to deliver water into the facility to minimize storage costs.	The target parcels are 200 feet topographically lower than the California Aqueduct and 105 feet lower than hydraulic head in LAA#2.
Topographically higher than client agencies that would use the storage to minimize delivery costs.	The target parcels are topographically higher than all of Southern California, Rosamond, Palmdale and Lancaster
Less than 2-miles to at least 2 regional conveyances	The target parcels are immediately adjacent to LAA#2 and within 1-mile of the AVEK West Feeder.
Electrical and gas utility lines available within 1-mile of target properties	The target parcels have electric service and are adjacent to gas service.
Existing wells and piping that could be incorporated into the facility	The target parcels have 10 existing wells that were rehabilitated in 1998 and 4.5-miles of

Criterion	Target Area
	irrigation piping connected to the AVEK West Feeder
At least 200 cfs of wheeling capacity in regional conveyances	LAA#2 has a conveyance capacity of 290 cfs – reverse flow is possible. The AVEK West Feeder has a conveyance capacity of 225 cfs.
Economic Criteria	
A CAPEX of no more than $1,500/AF of annual capacity.	WDS estimates a CAPEX of $588/AF of capacity.
A present value of CAPEX and OPEX of no more than $1,500/AF of annual capacity.	WDS estimates a PV of $811/AF of capacity.
An ability to continue obtaining agricultural revenues from the land through organic farming during non-recharge periods (up to 70% of the time).	The target parcels are currently farmed in carrots and could be converted to organic certification within 3-years.
Environmental and Permitting Criteria	
Well documented historical land use and crop types	The target parcels have well documented use.
No historical land uses that could have left behind leachable concentrations of contaminants that could significantly degrade groundwater when mobilized by recharge operations	WDS has found no evidence of past land uses that would degrade groundwater quality other than typical irrigated farming. Groundwater samples from the most heavily used area show no degradation.
No current or past surrounding land uses that would degrade groundwater quality (1-mile radius)	WDS has reviewed agency databases and performed drive-through inspections. WDS has <u>not</u> found evidence of: CERCLA sites, Superfund sites, RCRA sites (generators, treatment, storage or disposal), Federally reported spill sites, corrective action sites, leaking underground tank sites, underground tank sites, Department of Defense sites, water or wastewater treatment plants, NPDES discharge points, landfills, Indian reservations, pipeline incidents, toxic pits, cattle dip sites, crop duster runways, mines, PCB sites, TSCA spill sites, permitted air emission sites, manufactured coal gas sites, brownfield sites within 1-mile of the target parcels. Bio-Gro (a biosolids facility) was located ½ mile to the east, but the facility ceased operations in 1996 and was located in the Lancaster Sub-Basin. Groundwater from that area does not flow beneath the target properties.
In a county that is familiar with water banks and accepts water banks as compatible with Williamson Act contracts	The target parcels are in Kern county which already has several operating water banks. The Kern County assessor has indicated a willingness to consider water banking as compatible with Williamson Act contracts.
No wetlands, or other waters of the US on the target properties	WDS has not found evidence of natural wetlands or other waters of the US on the target parcels.
No federal nexus for a NEPA EIS	WDS has not identified any Federal nexus for NEPA compliance.
On land with no protected habitats or species (i.e. farmland)	The California Natural Diversity Database does not identify any endangered or threatened species in the vicinity of the target parcels.
Political and Land Use Criteria	
A local water agency that is willing to be the lead for CEQA, owner and operator	WDS has identified several agencies that believe the Project is needed and feasible.
Local need that is sufficient to entitle the Project within 2-years	The local need is acute. Will-serve letters are no longer being issued to developers.

Criterion	Target Area
No known historical or current opposition to water banking	WDS is not aware of any historical opposition to a project of this type.
Surrounding landowners open to the idea	WDS has spoken with surrounding land owners. None have voiced opposition and several are vocally in favor of the Project.
Available parcels not significantly sub-divided	The subject parcels have not been significantly sub-divided.

Chronology of Work

Table 5: Chronology of Work

Date	Activity
Nov 2001	WDS began screening potential project locations through use of GIS.
Jan 2001	WDS selected a 400 square mile area in the west end of the Antelope Valley and compiled information from previous investigations.
Feb 2001	WDS performed site reconnaissance and prepared preliminary cost estimates for 3 alternate locations. WDS met with several land owners.
Mar 2001	WDS selected a target area for field investigation.
Apr 2001	WDS contacted additional land owners, negotiated access agreements, and finalized scope of field work.
May 2001	Layne lithologically logged 17 backhoe trenches that were 11 to 15 feet deep (12.4 feet average), performed sieve analyses on 51 soil samples (3, 6 and 9 feet, bgs), and performed 16 infiltration tests that ranged from 1.5 to 23 hours (14.6 hour average).
June 2002	WDS interpreted soils data using US Salinity Laboratory software Rosetta and used GIS to correlate results to Soil Conservation Service (now Natural Resource Conservation Service) soil types.
May 2002	WDS reviewed assessor parcel data, soil types, land uses, habitat data and selected a short list of potential target parcels. WDS contacted land owners.
June 2002 through May 2003	WDS performed preliminary cost estimation, financial analysis, comparables analysis, fatal flaw analysis and negotiations with various land owners.
June 2003	Layne sampled 2 irrigation wells on the target parcels and analyzed samples for Title 22 parameters and major ions.
July 2003	WDS made presentation to AVEK board.
July-August 2003	Layne advanced 3 borings to 398, 438 and 478 feet, bgs; E-logged each boring, collected formation samples at 5-foot intervals, collected 24 soil samples for sieve analyses and collected 4 borehole water samples (2 filtered and 2 unfiltered) for Title 22 and major ion analyses.
August 2003	WDS completed the fatal flaw analysis and prepared a development plan.
November 2003	WDS made presentation to the Antelope Valley State Water Contractors Association (AVSWCA).
December 2003	WDS continued to refine comparables analysis and the development plan.
January 2004	WDS made presentations to Palmdale Water District and Littlerock Creek Irrigation District. WDS submitted a detailed document in response to AVSWCA questions.
February through April 2004	WDS performed revised cost and wheeling capacity analyses under slightly different parcel configurations.
May 2004	WDS met with the general managers of AVEK, Palmdale WD and Littlerock Creek ID.
June 2004	WDS submitted a draft letter of intent to the AVSWCA.
July 2004	WDS held individual discussions with AVEK, Palmdale WD and Littlerock Creek ID regarding the draft LOI.
August 2004	WDS made a presentation to Rosamond Community Service District and met with Palmdale WD and Littlerock Creek ID.
September 2004	WDS met with the AVSWCA. During that meeting a committee was assigned to review the Project.

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Date	Activity
October 2004	WDS met with the AVSWCA water bank committee and with the Los Angeles Department of Public Works (LADPW).
November 2004	WDS met with the LADPW, the Farm Bureau, the Builders Industry Association and Kern County Board of Supervisors.

The remainder of this report presents the findings and WDS interpretations from the work listed above.

Location, Jurisdictional Boundaries and Zoning

The target area includes 1,629 acres of farm land that are irrigated by both groundwater and AVEK surface water. The target parcels are in an entirely agricultural area. There are no known past or current adjacent land uses that would have significantly degraded groundwater quality aside from normal farm operations. Bio-Grow (a bio-solids facility) was located ½ mile to the south-east. However, that facility ceased operations in 1996 and was in the Lancaster Sub-Basin. USGS and DWR studies indicate that groundwater from that area does not flow beneath the target parcels. On-site sampling has confirmed that there has not been groundwater quality degradation.

Location and Setting

The target area includes 10 parcels totaling 1,629 acres (2.5 square miles). Figures 1 through 3 depict the locations of the target parcels in the Neenach Sub-Basin of the west end of the Antelope Valley of Kern County, California. The parcels are located in the surface water service area of AVEK and include two 18 inch turnouts from the AVEK West Feeder. The target parcels are approximately 10-miles west of Rosamond, 23-miles northwest of Palmdale and 17-miles northwest of Lancaster. The land is currently farmed in carrots, onions and grain. The land is bordered by the following features:

- To the west*: 170th Street West (underlain by LAA#2);*
- To the north*: an unpaved farm road;*
- To the east*: 150th Street West (unpaved); and*
- To the south*: Avenue A (the Los Angeles – Kern County Line).*

The area is bounded by the Tehachapi Mountains to the north and the San Andreas Rift Zone to the south. The valley floor slopes from northwest to southeast with an elevation drop of 95 feet from 2,690 feet above mean sea level (feet, msl) at the northwest corner to 2,595 feet, msl at the southeast corner. Antelope Valley is arid, averaging <10 inches of rain per year. Natural aquifer recharge is insignificant and this area is considered the western extreme of the Mojave Desert. The target parcels are located in the following administrative areas:

- Not incorporated;
- AVEK surface water service area;
- South Lahontan basin of the Lahontan Regional Water Quality Control Board;
- The Antelope Valley Groundwater Basin (USGS Basin1699);
- DWR basin 6-44 (9626.400004), Antelope Hydrologic Unit 626;
- DWR Detail Analysis Unit (DAU) 305;
- Fairmont Butte Quadrangle;
- Zoning and Case Maps 233, 232; and
- Assessor Map Books 261 and 359.

Nearby Land Uses

The target parcels are in an unincorporated rural area with the surrounding land uses:

- Immediately west: active row crop farm land with a homestead;
- Immediately north: active row crop land and historically farmed, but currently fallow land;
- Immediately east: active row crop land, a homestead and historically farmed, but currently fallow land; and
- Immediately south: historically farmed, but currently fallow land.

Other nearby land uses within a 10-mile radius are as follows:

- Bio-Gro (a bio-solids facility) was located ½ mile to the southeast within the Lancaster Sub-Basin. That facility ceased operations in 1996 and as detailed in a following section, numerous USGS and DWR studies indicate that groundwater does not flow from that area towards the target parcels due to the intervening Neenach Fault and significant groundwater pumping centers further to the east;
- The target parcels are transacted southeast to northwest by a Southern California Edison transmission line;
- The Skyotee Ranch Airport (private, dirt runway) is 1-mile to the northeast;
- Willow Springs is 6-miles to the northeast;
- Willow Springs Butte and Willow Springs Raceway are 7-miles to the northeast
- Rosamond is 10-miles to the east;
- Antelope Acres is 8-miles to the southeast;
- The Antelope Valley State Poppy Preserve (Antelope Buttes) is 4-miles to the south;
- Fairmont is 6-miles to the south; and
- Neenach is 10-miles to the southwest.

All other land within a 10-mile radius is farmland, rural homesteads or native desert land. WDS performed a review of regulatory agency databases and did not find any documentation of the following types of sites within a 1-mile radius of the target parcels:

- No locations with earthquake epicenters exceeding a magnitude of 6 on the Richter Scale;
- No perennial water (1-mile radius);
- No CERCLA or Superfund sites (NPL or non-NPL);
- No RCRA large or small quantity generators of hazardous waste;
- No RCRA treatment, storage or disposal sites;
- No RCRA sites undergoing corrective action;
- No federally reported spill sites;
- No Department of Defense or Department of Energy managed sites;
- No Indian reservations;
- No State reported underground storage tank or leaking underground storage tank sites;
- No State reported hazardous waste, toxic spill, toxic pit, solid waste, voluntary cleanup or hazardous substance container sites;
- No mines;
- No federally reported PCB sites;
- No TSCA spill sites;
- No state or federally permitted air emission sites;
- No manufactured coal gas sites; and
- No brown field sites.

Nearby Water Features

As indicated above, there are no perennial water bodies within a 1-mile radius of the target parcels. The parcels have been levelled and do not include any natural drainages. However, the following natural and man-made water features are located within a 10-mile radius of the target parcels (Figures 1 through 4):

- LAA#2 is immediately adjacent to the west side of the target parcels beneath 170th Street West. LAA#2 is a 120- inch diameter, underground, steel pipeline installed in 1970 by the LADWP to convey water from the Owens Valley to Los Angeles. The pipeline typically operates under 52 psi of pressure and has a conveyance capacity of 290 cfs;
- LAA#1 is 3.9 miles north, 8.8 miles west and 7.4 miles south. LAA#1 is a 132 inch diameter, partially underground, steel pipeline installed in 1913 by the LADWP to convey water from the Owens Valley to Los Angeles. The pipeline has a conveyance capacity of 485 cfs;
- The AVEK West Feeder is 1-mile east. The West Feeder is a 33" to 60" inch diameter, underground, steel pipeline installed by AVEK to convey SWP water from the California Aqueduct (Turnout 20A) to Rosamond and farmers. The pipeline has a conveyance capacity of 225 cfs;
- The East Branch of the California Aqueduct is 7-miles south. The Aqueduct is a concrete lined canal that was constructed (in this area) by the DWR to carry surface water from the Bay-Delta to contractors of the SWP. In this area the aqueduct has a capacity of 2,010 cfs;
- WDS is aware of 24 wells within a 1-mile radius of the target parcels. Of this total, 10 wells are located on the target parcels. The wells are used for irrigation;
- WDS is aware of 60 wells near or down-gradient of the target parcels within the Neenach Sub-Basin. Of this total, 10 wells are located on the target parcels. An additional 12 wells are known within the Sub-Basin, but they are up-gradient and more than 9-miles to the west of the target parcels;
- WDS is aware of 238 wells in the Lancaster Sub-Basin within 10-miles of the target parcels (to the east and south); 25 wells in the Willow Spring Sub-Basin within 10-miles of the target parcels (to the northeast);
- Kings Canyon Percolation Basins are 6.5-miles to the southwest;
- Fairmont Reservoir (general dry) is 7.9-miles to the south;
- Holiday Lake is 8.3-miles to the west (man-made);
- Bean Spring is 5.3-miles to the northeast;
- Mud Spring is 7.4-miles to the south;
- Indian Spring is 8.7-miles to the southeast;
- The terminus of the distributary channel of ephemeral Cottonwood Creek is 1-mile north; and
- Several unnamed ephemeral drainages are 1-3 miles northwest and southwest.

As indicated on Figure 5 (which is a Landsat 7 image), the target parcels are located within the historical distributary fan of Cottonwood Creek.

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Regulatory Jurisdiction

Agencies that control land and water use in the target area include the following (Figure 3):

- AVEK (delivery of surface water and use of the West Feeder);
- LADWP (use of LAA#1 and LAA#2);
- California Superior Court for Riverside County (to rule on the Diamond and Bolthouse lawsuits);
- California Superior Court for Riverside County (to rule on the LADPW adjudication filing);
- Kern County Assessor Office (land use zoning and Williamson Act);
- Kern County Department of Roads (right of way);
- Kern County Board of Supervisors (exportation of groundwater);
- Lahontan Regional Water Quality Control Board (South Lahontan Basin);
- DWR (wheeling in the California Aqueduct); and
- California Department of Fish & Game (habitat and wildlife protection).

The target parcels are zoned Zone A FPS - Exclusive Agriculture (floodplain secondary combining). Uses in this A district are limited to agriculture and other compatible activities, including water storage and ground water recharge facilities. Two of the parcels (totalling 640 acres) are enrolled in the Williamson Act as agricultural preserves.

Property Description

The target parcels have been farmed since at least 1960 and are currently leased to Peter Rabbit Farms to cultivate onions, carrots and grain. The parcels include 10 wells, 4.5-miles of irrigation piping connected to the AVEK feeder, four work shops and two residences. Two parcels totaling 640-acres are encumbered with Williamson Act contracts. WDS believes that there would be legal, contractual and economic factors ensuring that the Project has a right to storage space and would be protected from "theft" of stored water – as long as the Project owns the overlying property. WDS did not identify any regulatory issues that would be fatal to use of the target parcels for water banking and it is likely that permitting requirements would be minimal. WDS did not identify any fatal flaw environmental conditions that would prevent use of the target parcels for recharge, storage or recovery of water. One typical domestic trash pit was found. Underlying soils should be sampled and the trash removed prior to use of the site for recharge. No contaminants were detected in groundwater.

Current and Historic Land Uses

The following summarizes acreages, improvements and current uses of the target parcels.

Table 6: Current Use Summary

APN TRS	Acres	Prime Farmland?	Improvements	2004 Use
26119609 T9NR15WS25	318	Yes	Deep ripped to 35" in 2000, leveled with soil amendments, 1 well (sampled by WDS), transected by power line, AVEK service	Onions
35904101 T9NR14WS30	40	Yes	Deep ripped to 35" in 2004	Fallow
35904112 T9NR14WS30	160	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, 2 wells (1 sampled by WDS), old above ground fuel distribution structure, storm water collection pond, buried 18" steel irrigation piping, AVEK service, electric service	Carrots
26119611 T9NR15WS25	160	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, 1 well, 1 tailwater pond, transected by power line, equipment storage area, 1 worker residence, 1 work shed, buried 12" irrigation piping, AVEK service, electric service, telephone service	Carrots
35904111 T9NR14WS30	160	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, met station, 1 tailwater pond, buried 12" PVC irrigation piping, AVEK service, electric service	Carrots
35904117 T9NR14WS31	157	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, 1 well, 1 tailwater pond, buried 12" to 18" steel irrigation piping, AVEK service, electric service	Grain
35904118 T9NR14WS31	153	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, 2 wells, 2 tail water ponds, transected by power line, 2 work shops, 12" steel irrigation piping, AVEK service, electric service, telephone service.	Grain
26119604	160	Yes	Farmed since at least 1960, deep ripped to 35",	Carrots

APN TRS	Acres	Prime Farmland?	Improvements	2004 Use
T9NR15WS36			transected by power line, 1 tail water pond, 1 well, AVEK service, electric service.	
26119602 T9NR15WS36	202	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, transected by power line, 1 well, 1 residence, buried 12" steel irrigation piping, AVEK service, electric service, telephone service	Grain
26119603 T9NR15WS36	120	Yes	Farmed since at least 1960, deep ripped to 35", leveled with soil amendments, equipment storage area, 1 well, 1 work shop. Household refuse pit next to shop, electric service, AVEK service	Grain
Total	**1,629**	**Yes**	**10 wells, 4 work shops, 2 residences**	**Onions, grain, carrots**

TRS: Township/Range/Section
Prime Farmland: Defined in 2002 by the Ca Department of Conservation, Division Of Land Resource Protection

WDS reviewed aerial photographs from 1961, 1965, 1968, 1994, 2000 and 2003 (Landsat 7). That review confirmed that, with the exception of 1 parcel (APN 26119609), the land has been in agricultural use since at least 1960. Figure 4 depicts current target parcel conditions.

Leases and Contracts

As previously indicated, 2 parcels totalling 640-acreas are encumbered with Williamson Act contracts which afford the property owner lower taxes, but require that the land remain in agricultural use (or fallow). Cancellation of Williamson Act contracts would increase property taxes by up to 75% and would include a Kern County fee equal to 12.5% of the property value. However, the County may consider alternation of water banking and farming within basins to be compatible with the Williamson Act – thus avoiding cancellation fees and higher taxes. If this approach were pursued, organic farming techniques would be preferred to ensure that agrichemicals are not mobilized during recharge events. The property is Zoned A. Kern County includes water banking as an acceptable land use in this zone.

The target parcels are currently leased to Peter Rabbit Farms, with the exception of parcel 35904101.

Water Facilities

The target parcels include 10 irrigation wells (with 2 historically abandoned wells) and two 12" to 18" diameter, buried steel and PVC pipelines which deliver surface water from the AVEK West Feeder (Figure 4). Well details are summarized on the following table and the locations of the wells and farmer owned pipelines are depicted on Figure 4.

Table 7: Well Details

USGS Well Number	Installation Date	Depth (feet) Diameter (in)	Yield	Water Levels (ft, bgs)	Driller Log
T9NR15W-25D (Destroyed)	1946	148'(?) 8" Perf: 153-344'		227' in 1948 264' in 1956 Dry in 1957 Dry in 1962	70': sand 100': sand & gravel 130': sand and boulders 160': gravel 190': sand & gravel 220': boulders & gravel 245': sand & gravel 275': gravel & clay 300': clay 344': gravel & clay Log by F Rottman Drilling
"Field Well" T9NR15W-25F Sampled 06/03	1977 Rehabilitated in 1998	850' 14"	94' drawdown @ 800 gpm 112' drawdown @ 1,000 gpm	358' in 1977	10': clay w/ silt 60': sand w/ gravel 95': sand 250': sand w/ clay
T9NR15W-25R	1965 Rehabilitated in 1998	780' 14"	28' drawdown @ 1,500 gpm 35' drawdown @ 1,700 gpm 37' drawdown @ 1,850 gpm 45' drawdown @ 2,150 gpm	280' in 1965	Not available
T9NR14W-31D May be tracked as T9N14W-30N in DWR database	Unknown, rehabilitated in 1998	14"	At least 1,000 gpm	342' in 1986	Not available
T9NR14W-31M	1963 Rehabilitated in 1998	713' 14" Perf: 347-713'	50' drawdown @ 1,200 gpm	204' in 1963 240' in 1968	20': sand & silty clay 95': sand & gravel 218': sand, gravel & streaks of clay 225': sand 518': sand w/ clay streaks 580': sand w/ clay streaks 694': sand w/ clay streaks 713': clay Log by Evans Brothers Drilling
T9NR14W-31L	Unknown, rehabilitated in 1998	Unknown	At least 1,100 gpm	Unknown	Not available
"Station Well" T9NR14W-30K Sampled 06/03	1891, replaced in 1960, rehabilitated in 1998	255' deepened to 703' 7" increased to 14" Perf: 340-703'	56' drawdown at 1,170 gpm	180' in 1908 267' in 1961	10': soil 15: sand & gravel 29:sand & gravel 35': sand & gravel w/ streaks of clay 68': sand & boulders 109': sand, gravel, clay, rocks 182': sand & gravel w/ streaks of clay 190: sand 204': sand with thin streaks of sandy

USGS Well Number	Installation Date	Depth (feet) Diameter (in)	Yield	Water Levels (ft, bgs)	Driller Log
					clay 230': gravel & sand 247': clay 300': sand & clay 352': Clay w/ sand 356': sand 440': clay w/ sand 445': sand 495': sand w/ streaks of clay 550': clay w/ sand 590': clay w/ sand 598': Clay, sandy 600': boulders 610': clay, sandy 703': clay w/ sand streaks Log by Evans Brothers Drilling
T9NR14W-30R	Unknown, rehabilitated in 1998	Unknown	At least 1,100 gpm	Unknown	Not available
T9NR15W-36C	Unknown, rehabilitated in 1998	Unknown	At least 1,300 gpm	Unknown	Not available
T9NR15W-36E	Unknown, rehabilitated in 1998	811'	8' drawdown at 2,000 gpm	224' in 1969	Not available
T9NR15W-36K	Unknown, rehabilitated in 1998	850'	5' drawdown at 1,800 gpm	290' in 1974	Not available
T9NR14W-30H No longer present	Unknown, was observed in 1962	Unknown	Unknown	Unknown	Unknown

Storage Rights

Background

In the early 1900's the water table beneath the Project area was 100 to 200 feet below ground surface. However, agricultural pumpage lowered the water table until AVEK began importing SWP surface water in 1974 (causing a decrease in groundwater pumpage). Water levels stabilized in the mid-1980s as depicted on Figure 8.

The water table now averages 341 feet below ground surface, with seasonal irrigation season declines of 5 to 20 feet. The Project would store imported surface water in dewatered space above the current water table. Some of the recharged water would migrate laterally from beneath project owned land to beneath surrounding properties owned by others, raising the water table beneath those properties. Two issues of concern are as follows:

- Would the Project have the right to storage space beneath adjacent properties?
- What would prevent others from recovering stored water in advance of the Project?

The following sections analyze the legal, contractual and economic factors surrounding these issues. It should be noted that this analysis is predicated on the assumption that the Project would only proceed if it is developed with the knowledge, consent and cooperation of surrounding agencies and landowners and that the rights of each party would be contractually defined in advance of construction (based on templates from other successful Kern County water banks).

<u>Legal Issues</u>

Rights to underground storage space and stored water are not defined in California statutes or local ordinances. However, legal precedents have been used to establish the following rights for other successful water banks:

- Storage space in an aquifer is a shared asset that all overlying landowners have a right to use. Courts have ruled that a land owner may not exclude a second land owner from using aquifer storage space as long as the use of this space is not to the detriment of the first land owner;
- Public agencies have a right to import water, store it underground and recover a similar amount (less reasonable losses);
- Recharge, underground storage and recovery operations can be performed by water agencies that otherwise have no statutory authority to manage groundwater; and
- Adjacent landowners are not restricted from reasonable beneficial use of groundwater and are not required to stay within historical usage. Consistent with correlative groundwater rights, the rule is avoidance of mutual harm, typically defined as maintaining withdrawals below the basin's safe yield (absent water banking operations).

Regarding the last item, the water level record (Figure 8) demonstrates that the Neenach Sub-basin was in overdraft until SWP water was imported, decreasing groundwater pumpage. If an adjacent landowner were to significantly increase groundwater pumpage to take advantage of water stored by the Project, the adjacent landowner could be sued for adversely affecting the Project. The basis of the suit would be three-fold:

- The adjacent landowner has caused project recovery costs to increase (by lowering the water table);
- The adjacent landowner has taken surface water owned and stored by the Project. Water stored for the Project would have an identified end user. While the timing of recovery for use by that end user may not be defined, the stored water is effectively allocated and cannot be included within the basin water balance; and
- The adjacent landowner has exceeded the safe yield of the basin (absent the Project). It should be noted that this last basis has little weight in an un-adjudicated basin where there is no specific requirement that overdraft be prevented.

The following is a synopsis of the case history.

City of Los Angeles v. City of Glendale (23 Cal. 2d 68, 76-77, 132 P.2d 573, 1943)
California Water Code Section 7075 states, "…water which has been appropriated may be turned into the channel of another stream, mingled with its water, and then reclaimed; but in reclaiming it the water already appropriated by another shall not be diminished." The Court

extended provisions of Section 7075 to include addition and withdrawal of water to/from an underground basin. However, the Court did not distinguish between the rights to storage space and the rights to recover water.

The City of Los Angeles v. City of San Fernando (14 Cal. 3d 199, 1975)
The California Supreme Court upheld the1943 ruling, but clarified various issues as follows. The City of Los Angeles claimed rights to groundwater it had imported and recharged into the basin. The Court upheld the Los Angeles Department of Water and Power (DWP) right to import and store water underground despite the DWP's lack of any statutory authority to manage groundwater, stating, "…an undivided right to a quantity of water in the ground reservoir equal to the net amount by which the reservoir is augmented by [imported water]." The court did not require compensation for use of storage space subject only to the limitation that storage and withdrawals do not harm other legal users.

Niles Sand and Gravel Company, Inc. v. Alameda County Water District (37 Cal. App. 3d 924, 112 Cal. Rptr., 1975, cert. Denied 419 U.S. 869, 1975)
The water district had recharged imported water, raising the water table in the vicinity of the gravel company's excavations. The gravel company had historically established a right to pump groundwater and commenced to dewater their pits. The Court held that the water district had the right to store water in the natural underground storage space without compensation to the gravel company and to prevent the gravel company from taking the stored water. Several analysts have concluded that water district storage rights allowed by this case are limited to those that can be used without detriment to reasonable beneficial uses of the overlying land.

Chapter 268 of the California Statutes of 1985 (authored by Senator Ruben Ayala, signed by the governor in July 1985) now California Water Code Section 11258
This Section expressly authorizes the DWR to use groundwater storage space south of the Sacramento-San Joaquin Delta to provide yield for the SWP. The Project would likely store SWP water and would likely be owned/operated by a SWP contractor(s). Therefore, while this section of California Water Code is not directly applicable to the Project, it is evidence of consistency with DWR objectives.

Katz v. Walkinshaw (141 Cal. 116, 1903)
The California Supreme Court established the Doctrine of Correlative Rights. Each overlying landowner was entitled to make reasonable beneficial use of groundwater with a priority equal to all other overlying users. These rights are not quantified or prioritized by historic use. The only limitations are "reasonable beneficial use" and mutual avoidance of harm. Mutual avoidance of harm is usually defined as not exceeding the safe-yield of the basin. The beneficial use provision is defined in Article X, 2 of the California Constitution.

<u>Economic Issues</u>

As detailed in the previous section, the operator of the Project would have the right to store water underground and could sue others who might "steal" the stored water to the detriment of the Project. In reality, legal action has not been required on other recent projects because there are overriding benefits to farmers that cooperate with water banks in managing groundwater levels. This section details these very real economic benefits and provides examples from other water banks in Kern County.

Before entering into a discussion of project benefits to surrounding farmers, it is important to note that the Project would (as with other projects of this kind), enter into an operating agreement with surrounding entities (other agencies and/or land owners) that would dictate the following:

- A percentage of imported water that would be left in the aquifer (i.e. may not be recovered by the Project) to help restore water levels and benefit local pumpers. This percentage, based on local hydrogeologic conditions, usually ranges from 5% to 10% of all imported water;
- A requirement that the Project may not "take out loans" in anticipation of future recharge. In other words, the Project may only recover volumes that have already been recharged (less loss to the aquifer);
- Monitoring of recharge water quality, with criteria for shut-down if quality is unacceptable;
- Water level monitoring in perimeter wells, with criteria for shut-down if levels rise above or decline below "red-line" levels;
- Pre-specified conditions under which farmers would be compensated if their pumping costs increase as a consequence of bank operations; and
- Agreement that farmers would not mine water recharged and stored for the Project.

These agreements ensure that project and farm operations are adjusted before damage occurs. Layered on top of these protections, adjacent pumpers are afforded access to shallower groundwater levels which, if managed wisely, significantly reduce long-term operating costs. While there would appear to be a temptation for pumpers to not enter into these agreements and increase their irrigated acreages to take advantage of this low-cost water, pumpers do not act on this temptation for the following economic reason. The Project has a legal right to and would eventually recover a volume of water equal to that which was recharged (less aquifer losses) – regardless of the fate of the originally recharged water. If the originally recharged water has been extracted by others (and water table levels have dropped back to pre-project levels), the Project would pump its allowed volume and cause the water table to drop even further – below pre-project levels (and increasing pumping costs for both the Project and farmers). While recovery would be more expensive for the Project than would be the case if the surrounding farmers cooperate, the costs are still easily affordable to the Project. Whereas farmer profit margins are narrower and generally cannot absorb the long term pumping cost increase – causing the new irrigated acreage to fall back out of use. This scenario is depicted on Figures 9 and 10 (please note, these figures are presented for illustrative purposes only and are not based on rigorous modeling of actual operations).

The green line on Figure 9 depicts the depth to water under the current level of agricultural activity (absent the Project). As indicated on Figure 10, groundwater pumping costs average \$81/AF under these conditions. The blue line on Figure 9 depicts how the depth to water would vary if agricultural activity stays relatively consistent with current conditions and the Project is implemented. As indicated, the water table would rise during recharge years and decline during recovery years, but would stay above current conditions due to the percentage of water left behind for aquifer recovery. As depicted on Figure 10, under this scenario pumping costs would range from \$41/AF to \$78/AF with a long term average of \$55/AF. The

red line on Figure 9 depicts how the depth to water would vary if irrigated acreages were increased to take advantage of cheap water caused by project recharge. As indicated, there would be an initial rise in the water table, but it would be offset by increased agricultural pumpage and the basin would go into overdraft when combined with project recovery operations. As indicated on Figure 10, there would be a short-term decrease in pumping costs, but within a few years, costs would rise above $81/AF, eventually rising as high as $133/AF.

Table 8: Summary of Pumping Costs Under Various Scenarios

(For illustrative purposes only)

Scenario	Range of Pumping Costs ($/AF)	Long-Term Average Pumping Cost ($/AF)
Current agriculture	$79 - $84	$81
Current agriculture and Project	$41 - $78	$55
Expanded agriculture and Project	$53 - $133	$94

The clear lesson from this analysis is that it would not pay for an adjacent farmer to bring more land into production. Conversely, if adjacent farmers work in conjunction with the Project, recognizing that the imported water is owned by others, they would benefit from an average 32% decrease in pumping costs. Farmers surrounding other water banks have understood this issue, cooperated with the water banks and benefited accordingly as depicted on Figures 8 through 10.

<u>Contractual Issues</u>

As indicated in the previous section, operating agreements protect rights of the Project participants and adjacent entities. To elaborate, the water bank authority enters into a contract with surrounding agencies that defines baseline conditions, how the aquifer would be monitored, circumstances under which operations would be altered and conditions under which damage would be reimbursed. The Kern Water Bank Authority (KWBA) Memorandum of Understanding (MOU) with numerous surrounding agencies is the prime template upon which most of these agreements are based. A key element of the MOU structure is to provide flexibility for adjustment – but only through consensus amongst members of a Monitoring Committee that includes the adjacent agencies and landowners. The “golden rule” for participation in these MOUs is to abstain from actions that would make conditions worse, absent the Project. Dramatic increases in groundwater pumpage by an adjacent farmer would certainly lower the water table below current levels absent the Project and therefore, these operating agreement form the basis for prohibiting unchecked expansion of irrigation, including monitoring, decision making, dispute resolution and compensation in the event the “golden rule” is broken. These agreements in no way limit a farmer’s right to use his land in any fashion that would have occurred absent the Project and, as detailed above and below, there are significant benefits for those farmers that participate in these agreements.

In addition to operating agreements, water banks commonly enter into specific contracts with individual farmers in which 2-way piping is installed from the water bank to the farmer’s well(s). In wet years the water bank makes inexpensive water available to the farmer at a

price that is less than that of groundwater pumpage. This in-lieu delivery causes a like amount of water to be banked in the aquifer (less loss). In dry years, the water bank would have the right to use the farmer's well to recover banked water, but only if the farmer does not need the well during that same period. Benefits for the Project and the farmer are as follows:

Benefits to the Farmer

- The Project pays for all new piping and contributes to the cost of maintaining the well;
- The Project periodically makes water available at prices below the pumping costs of groundwater;
- The farmer maintains ownership and a first right to use the well;
- The Project typically pays a fee to the farmer when the well is used for recovery;
- The agreement does not in any way change or diminish the farmer's right to pump groundwater (and under adjudication the surface water delivery is tracked as equal to groundwater pumpage);

Benefits to the Project

- Reduction of capital costs associated with drilling new wells and extending the power grid; and
- Expansion of banking capacity through in-lieu deliveries to farmers (conjunctive use).

In summary, there are significant legal, economic and contractual reasons why adjacent farmers would not dramatically increase irrigation and "steal" water being stored for the Project. The key factors, proven valid at 12 other water banks in Kern County, are:

- The Project would have a legal right to store water in the aquifer beneath adjacent properties. Adjacent landowners may not hinder the Project's efforts if they do not damage those landowners;
- The Project would retain legal ownership of water stored in the subsurface and could sue to maintain that water in storage;
- Expansion of irrigation to take advantage of shallow water levels would take the basin into overdraft and ultimately increase pumping costs by more than 50%. Conversely, landowners continuing to farm at levels that have been proven sustainable would experience a 32% average reduction in pumping costs;
- Farmers that cooperate with the Project and enter into operating agreements would periodically receive surface water at costs below that of groundwater pumpage; would receive payments for periodic use of their wells (when not needed by the farmers); and would receive payments to help maintain the wells.

Groundwater Entitlements, Water Balance, Law Suits and Adjudication

The Antelope Valley and its Sub-Basins are not currently adjudicated. As a consequence the owner of the property has the right, by California law, to pump groundwater as desired for reasonable overlying use. Reasonable uses include agriculture, industrial, and municipal (residential) use. Unreasonable uses would include pumping excess water purely to establish a higher record of consumptive use. The historical record of groundwater pumpage can be important in several situations as follows:

- In the event that the basin is adjudicated, the historical record of pumpage would likely form the basis for the land owner's water right; and
- If new land owner wished to convert the land to a non-agricultural use (e.g. a housing development), the CEQA process would likely be used by Kern County to limit the amount of consumptive use of groundwater to historical levels or the estimated safe yield of the basin if the land has been fallow.

The Kern County Groundwater Management Ordinance (enacted 1998) requires a conditional use permit for export of native groundwater (with the exception of bottled water) and cannot exceed natural recharge. To-date, no permits have been issued to transfer native groundwater out of the county. Therefore, it is common practice to assume that Kern County groundwater cannot be transferred off the overlying land except for use in the immediate vicinity for similar uses.

The target parcels are served by 10 irrigation wells and two turnouts from the AVEK West Feeder. Table 9 summarizes AVEK surface water deliveries since 1998. The wells are not metered, therefore, Table 9 summarizes estimated groundwater pumpage (applied water), consumptive use (evapotranspiration of applied water, ETAW) and deep percolation based on the recent crop history. As indicated, WDS estimates that an average of 5,076 AF/year of water is applied to the target parcels, of which 28% (1,440 AF) is imported SWP water (although significant deliveries have not been made since 2001) with the remaining 3,636 AF being supplied by groundwater pumpage. WDS estimates that on-average this operation results in a gain of 434 AF to the aquifer through deep percolation of SWP water. The estimates presented on Table 9 are based on DWR draft estimates of applied water and evapotranspiration for specific crop types in DAU 305 with an underlying assumption that precipitation contributes negligible available water to crops during the growing season.

Table 9: Estimated Target Parcel Water Balance

Net Farmable Acres

Year	Alfalfa	Carrots	Grain	Onions	Potatoes	Fallow	Total
1998	0	152	1,056	0	0	340	1,549
1999	453	755	0	0	0	340	1,549
2000	453	905	0	0	152	38	1,549
2001	605	302	0	603	0	38	1,549
2002	605	306	297	302	0	38	1,549
2003	453	0	599	458	0	38	1,549
2004	0	608	600	302	0	38	1,549

Estimated Evapotranspiration (AF/yr), approx. Evapotranspiration of Applied Water

Year	Alfalfa	Carrots	Grain	Onions	Potatoes	Fallow	Total
1998	0	228	1,479	0	0	0	1,707
1999	2,651	1,397	0	0	0	0	4,048
2000	2,855	1,992	0	0	502	0	5,348
2001	3,540	559	0	905	0	0	5,004
2002	3,540	566	491	453	0	0	5,050
2003	2,651	0	989	687	0	0	4,327
2004	0	1,125	991	453	0	0	2,569

Estimated Applied Water (AF/yr)

Year	Alfalfa	Carrots	Grain	Onions	Potatoes	Fallow	Total
1998	0	220	1,479	0	0	0	1,699
1999	3,285	1,828	0	0	0	0	5,113
2000	3,693	3,069	0	0	772	0	7,534
2001	4,387	731	0	1,119	0	0	6,237
2002	4,387	740	614	560	0	0	6,302
2003	3,285	0	1,238	849	0	0	5,373
2004	0	1,471	1,240	560	0	0	3,272

Estimated Deep Percolation (AF/yr)

Year	Alfalfa	Carrots	Grain	Onions	Potatoes	Fallow	Total
1998	0	0	0	0	0	0	0
1999	634	430	0	0	0	0	1,065
2000	838	1,077	0	0	271	0	2,186
2001	847	172	0	214	0	0	1,234
2002	847	174	123	107	0	0	1,252
2003	634	0	249	163	0	0	1,046
2004	0	347	249	107	0	0	703

AVEK Deliveries (AF/yr)

Year	Alfalfa	Carrots	Grain	Onions	Potatoes	Fallow	Total
1998	0	253	1,696	0	0	0	1,949
1999	1,847	1,028	0	0	0	0	2,875
2000	1,267	1,053	0	0	265	0	2,584
2001	1,600	267	0	408	0	0	2,274
2002	125	21	17	16	0	0	179
2003	287	0	108	74	0	0	470
2004	0	0	0	0	0	0	0

Estimated Groundwater Pumpage (AF/yr)

Year	Alfalfa	Carrots	Grain	Onions	Potatoes	Fallow	Total
1998	0	0	0	0	0	0	0
1999	1,438	800	0	0	0	0	2,238
2000	2,427	2,017	0	0	507	0	4,950
2001	2,788	465	0	711	0	0	3,963
2002	4,263	719	597	544	0	0	6,123
2003	2,998	0	1,130	775	0	0	4,903
2004	0	1,471	1,240	560	0	0	3,272

Average applied water	5,076
Average consumptive use:	4,008
Average groundwater pumpage	3,636
Average deep percolation	1,069
Average % AVEK	41%
Average imported recharge	434

Regulatory Compliance and Limitations on Future Use

Waste, Underground Tanks and Other Potential Environmental Liabilities

WDS did not identify any fatal flaw environmental conditions that would prevent use of the target parcels for recharge, storage or recovery of water. One typical domestic trash pit was found. Underlying soils should be sampled and the trash removed prior to use of the site for recharge.

WDS performed several drive-through visual inspections of the target parcels, collected 6 groundwater samples for Title 22 analyses (2 from irrigation wells and 4 from undeveloped boreholes), advanced 17 exploratory trenches, performed an agency database review and submitted a detailed environmental questionnaire to the current property owner. Findings were as follows:

- *No contaminants detected in irrigation wells*: Wells T9NR15W-25F and T9NR14W-30K were sampled on June 10, 2003 by Layne. The unfiltered samples were analyzed for Title 22 parameters plus major ions. As detailed on Table 16, results were as follows:
  - Nitrate: 2.3-2.5 mg/l (CA MCL: 10-45 mg/l);
  - Total dissolved solids (TDS): 180-210 mg/l (CA SMCL: 500-1,000);
  - Total organic carbon: <0.7 mg/l;
  - Arsenic: <2.0 ug/l;
  - Chromium: 9.7-16 ug/l (CA MCL: 50 ug/l);
  - Lead: <5 ug/l;
  - Selenium: <5 ug/l;
  - Volatile organic compounds: non-detect;
  - Semi-volatile organic compounds: non-detect;
  - PCBs: non-detect;
  - Herbicides: non-detect;
  - Pesticides: non-detect;
  - Gross alpha: 3.1-6.56 pCi/l (CA MCL: 15 pCi/l);
  - Diquat: non-detect; and
  - Asbestos: non-detect.
- *No contaminants detected in groundwater samples from undeveloped boreholes*: Borings B-3 and B-4 (Figure 4) were sampled on July 25 and August 1, 2003, respectively, by Layne. Each sample was divided into an unfiltered and a filtered aliquot. The unfiltered aliquot was analyzed for inorganic Title 22 parameters and major ions. The filtered aliquot was analyzed for a select sub-set of parameters. As summarized below (and detailed in Table 16) slightly elevated concentrations of arsenic, chromium and lead were detected in the unfiltered aliquots. However, these analytes were not detected in the filtered analytes which removed significant levels of suspended formation material and drilling mud (see turbidity and suspended solids results from unfiltered aliquots). Based on these results and those from the irrigation wells, WDS has concluded that arsenic, chromium and lead would not be detected at significant concentrations in properly installed and developed recovery wells.
  - Unfiltered nitrate: 9-11 mg/l (CA MCL: 10-45 mg/l);
  - Unfiltered TDS: 200-240 mg/l (CA SMCL: 500-1,000);
  - Unfiltered Total suspended solids: 460-3,600 mg/l;

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- Total organic carbon: 2.1-3.9 mg/l;
- Unfiltered turbidity: 990-2600 NTUs;
- Unfiltered arsenic: 5.4-8.5 ug/l;
- Filtered arsenic: <1 ug/l;
- Unfiltered chromium: 57-82 ug/l (CA MCL: 50 ug/l);
- Filtered chromium: <5 ug/l (CA MCL: 50 ug/l);
- Unfiltered lead: 9.3-13 ug/l;
- Filtered lead: <5 ug/l;
- Unfiltered selenium: <5 ug/l;

- *No underground tanks*: The target properties were not identified on local, state or federal agency lists as a known hazardous substance site or as historically including underground tanks. A structure resembling a gas station is located at the center of T9NR14WS30 (APN 35904112). However, the current owner indicates that the structure was only used as a location to dispense fuel from above ground tanks which have been removed. As indicated above, a well immediately adjacent to this structure was sampled and no contaminants were detected. WDS found no evidence of underground fuel tanks or waste oil tanks. The owner indicated that no underground tanks are or have been present at the target parcels;
- *Minor aboveground tanks*: WDS only found mobile above ground fuel tanks used for farm equipment. The owner indicated that there were historically above ground fuel tanks at the center of Section 30, but that those tanks were removed several years ago by a previous owner. WDS did not see any evidence of significant soil staining. There are several propane tanks at worker residences;
- *Likely typical domestic septic systems*: There are 2 worker residences that are likely served by septic systems;
- *Normal farm workshops*: There are 4 farm workshops that are used to store and work on equipment. WDS did not see any evidence of significant soil staining, waste oil storage or bulk solvent usage;
- *One domestic trash pit*: One domestic trash pit is located behind the shop of Section 36. While the pit is unlikely to prevent use of the site for recharge, a Phase II investigaton should include sampling of underlying soils and removal of waste;
- *De-minimus equipment and agricultural chemical storage*: WDS did not observe and the owner indicates that there are not any agrichemical washout areas, dips or container disposal sites on the target parcels. Several mobile tanks used for application of agrichemicals were observed;
- *Normal tail water ponds*: WDS observed tailwater ponds that are typical of the thousands of such ponds present throughout the valley.

Based on the findings presented above, WDS did not identify any known condition that would limit use of the properties for the Project. However, detailed due diligence should include the following work:

- Detailed inspection and potential soil sampling at the workshops;
- Soil sampling beneath the domestic trash pit; and
- Soil sampling at 2-3 representative tailwater ponds.

Regarding sampling at tailwater ponds, it should be noted that these features are on average less than 50 feet long and 20 feet wide. If agrichemical residues were detected in pond sediments, the affected sediment could be easily removed or excluded from the Project recharge pond areas. Therefore, even if impact were detected, WDS would not view this as fatal to the Project. WDS has recently sampled sediments from similar tailwater ponds on similar carrot fields operated by Bolthouse Farms in another part of Kern County. Agrichemical residues were not detected in any of the collected samples.

The property owner questionnaire is presented in Appendix B.

<u>Williamson Act</u>

See earlier section on this topic.

<u>Biological Resources</u>

This evaluation did not include inspection of the target parcels by a biologist qualified to provide opinions on the potential presence of various species or habitats. However, WDS reviewed the California Natural Diversity Database and visually inspected the properties. Results of these efforts were as follows. The target parcels are used entirely for agricultural (and supporting) purposes. Therefore, WDS does not expect that development of recharge facilities on the target parcels would entail destruction of native habitat. The possible exception might be wetland issues associated tailwater ponds. However, these ponds are intermittently dry and do not support any vegetation. Therefore, based on past experience with the Natural Resources Conservation Service and the US Corp of Engineers, WDS does not anticipate significant permitting issues with these features.

WDS performed a query of the California Natural Diversity Database on May 5, 2004 for the Fairmont Butte Quadrangle (which includes the target parcels) and 9 surrounding quadrangles. Results of this query were as follows:

- No Federal or California endangered or threatened species had been identified in the Fairmont Butte quadrangle;
- The nearest endangered species identified was the Spineflower, located south and uphill at least 7 miles from the target parcels; and
- The nearest threatened species was the Swanson's Hawk located at least 1 mile to the east of the target parcels. It should be noted that the Kern Water Bank has been found to enhance the hawk's habitat.

As a result of the findings above, WDS does not anticipate that the Project would require any permissions or permits relating to wetlands, habitat or wildlife. However, this finding should be confirmed through consultation with the California Department of Fish & Game, the US Fish & Wildlife Service and the US Corp of Engineers.

<u>Lahontan Regional Water Quality Control Board (South Lahontan Basin)</u>

WDS reviewed the Water Quality Control Plan for the Lahontan Region (October 1994) and the 2003 Triennial Review for issues or objectives that would impact the Project. According to the plan, surface water can be beneficially used to recharge groundwater and also for

delivery to the California Aqueduct and the Los Angeles Aqueduct. It should be noted that these approved beneficial uses apply to water originating within the basin and therefore do not apply to imported SWP water. Groundwater can be used for agricultural, municipal and industrial use. Both waters can also be used for fresh water replenishment. There are no special water quality objectives that apply to the Project area. The region wide objectives are applicable.

Water Bank Entitlement

Permitting requirements for a water bank would be minimal, potentially performed through a California Environmental Quality Act (CEQA) Initial Study and Negative Declaration. However, WDS has conservatively assumed that a CEQA Environmental Impact Report (EIR) would be performed by the lead agency. WDS estimates that a 2- to 5- year process will be required to prepare the EIR, consult with responsible agencies and negotiate contracts with various stakeholders.

WDS believes that the Project facilities must ultimately be owned and operated by a public water agency. While private entities may hold contractual rights to storage capacity, it is politically difficult for them to own or control the physical facilities. While there are no laws or regulations requiring public agency control, this is a political reality that has been amply evidenced by recent failures to develop private water projects in California (e.g. Azurix Madera Ranch, Cadiz, US Filter Salton Sea restoration). Conversely, there are several successful examples of private entities facilitating agency storage projects in exchange for rights to capacity (e.g. Paramount Farms/Kern Water Bank, Vidler Water Company/Semitropic, Newhall/Semitropic, Pastoria Power Plant/Kern Water Bank). Based on these beliefs, the Project would require a lead agency to ensure CEQA Compliance.

Initial Study and Negative Declaration

WDS believes that the Project would be classified as a “project” as defined by CEQA for the following reasons:

- It will require discretionary approval from AVEK, the LADWP and the DWR to construct interconnections and deliver water to/from the AVEK West Feeder, the LAA#2 and the California Aqueduct;
- It will require public works construction; and
- It may entail acquisition of grant monies, contributions or loans from other public agencies.

WDS does not believe that the Project would be statutorily exempted or categorically exempted from CEQA. Therefore, at a minimum, WDS believes that the lead agency would perform an Initial Study. As indicated on the following Initial Study check-list, it is conceivable that the Initial Study could conclude that the Project would cause no significant impacts on the environment or that potential impacts could be mitigated. Based on this finding, it is therefore possible that the lead agency could choose to issue a Negative Declaration or Mitigated Negative Declaration for the Project. There is precedent for this approach. In 1996, the Kern County Water Agency approved the Pioneer Groundwater Recharge and Recovery Project through a Negative Declaration and in 1996 Arvin Edison Water Storage District approved their water banking project with the Metropolitan Water district of Southern California through a Negative Declaration. In addition, the LADWP is currently in the process of implementing an interconnection between LAA#1 and the California Aqueduct in a similar fashion to that which is contemplated for this project. That project is being arranged entirely through inter-agency contracts.

Aesthetics

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Comments: The project would be located on current agricultural land in a sparsely populated area. The project facilities will sub-grade piping, low earthen berms and wells with very little visual difference from current uses.

Agricultural Resources

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	☒

Comments: The target parcels are encumbered with Williamson Act contracts and defined as Prime Farmland. However, the Kern County Assessor has indicated a willingness to consider water banking are compatible with these uses and in addition, the lead agency could continue to lease the recharge ponds for organic farming purposes during non-recharge periods (typically 8-10 months of the year).

Air Quality

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Conflict with or obstruct implementation of the applicable Air Quality Attainment Plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Comments: The project would require dust control during construction. Otherwise, project wells would be operated in the same manner as irrigation wells, but significantly less frequently. If required, the recovery well motors could be equipped with electric motors or fueled with propane and equipped with catalytic converters.

Biological Resources

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Comments: The project would be located on current agricultural land with no known surrounding sensitive or special status species. There are no known riparian habitats, wetlands, HCPs or migration corridors. In fact, facilities of this type have been found to enhance habitats and attract native species.

Cultural Resources

	Less Than Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Comments: There are no known cemeteries, historical, archaeological, or paleontological resources in the vicinity of the target parcels.

Geology and Soils

	Less Than Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒

ii)	Strong seismic ground shaking?	☐	☐	☐	☒
iii)	Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv)	Landslides?	☐	☐	☐	☒
b)	Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c)	Be located on strata or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d)	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property?	☐	☐	☐	☒
e)	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

Comments: The project would not entail construction of structure other than earthen berms. The project would require a soil erosion control plan both during construction and operation, but would not be located in an area with slope instability, expansive soils or wastewater systems.

Hazards and Hazardous Materials

		Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the				

	project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f)	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h)	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Comments: The project would not entail the handling or use of hazardous materials with the exception of potential fuel for recovery wells. The target parcels are not within 2-miles of a public airport and because of the low lying nature of the facilities, would not provide a hazard to private runways.

Hydrology and Water Quality

		Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a)	Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b)	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there should be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e)	Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems?	☐	☐	☐	☒
f)	Otherwise substantially degrade water quality?	☐	☐	☐	☒
g)	Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood				

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Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place housing within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation of seiche, tsunami, or mudflow?	☐	☐	☐	☒

Comments: The project would be compliant with water quality standards and by design, will not deplete groundwater supplies. In fact, a portion of all imported surface water would be left behind to help offset historical overdraft. The project would not alter drainages because current agricultural practices are designed to prevent run-off. The project will not entail housing or other structures that would place people in danger of flood or other hydrology related hazards.

Land Use and Planning

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural communities' conservation plan?	☐	☐	☐	☒

Comments: The project would not be in the vicinity of an established community or conflict with any zoning ordinances or HCPs.

Mineral Resources

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

Comments: The project would not deplete or affect any mineral resources.

Noise

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport of public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Comments: The project would be in a sparsely populated rural area. Noise during construction would be comparable to that associated with current agricultural operations and noise levels would be less than current conditions after construction is complete.

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Population and Housing

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☐
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Comments: The project would not displace existing housing. Depending on the intent and uses by the lead agency, population growth inducement may be a significant potential impact.

Public Services

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Comments: The project would not directly require increased coverage for the services listed above.

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Recreation

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Comments: The project would not directly cause an increase in the use of recreational facilities.

Transportation and Traffic

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

Comments: The project would cause a short-term increase in traffic during construction, but this impact could be mitigated through a standard construction management plan. After construction is complete, traffic would be reduced below pre-project levels due to the reduction in agricultural activities.

Utilities and Service Systems

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Comments: The project would not require wastewater treatment or changes to existing storm drainage facilities or landfills.

Mandatory Findings of Significance

	Potentially Significant Impact	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulative considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☐	☐	☐	☒
c) Does the project have environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Taken together, there is a logic and precedent to potentially achieving CEQA compliance through a Negative Declaration. However, given the regional and operational effects of this project, the lead agency may in their discretion decide to prepare an Environmental Impact Report. The following sections detail how that process might proceed.

Environmental Impact Report Overview and Critical Path

The Project would be located in the AVEK service area. The Project would use AVEK conveyances (along with LADWP conveyances) to deliver water to and recover water from the facility. A previously detailed, AVEK has concluded that storage is required in the Antelope Valley and that this project is technically feasible, but it is currently unclear which agency(ies) would lead this project. However the “permitting” path is similar under almost all scenarios. It should be noted that the term “permitting” is a misnomer. There are no water bank permitting requirements in Kern County or within the AVEK service area although certain local and state permissions would be required where project facilities would pass through and under roads and utility corridors. Permitting requirements for this project are relatively uncomplicated for the following reasons:

- The Project does not include use of any Federal systems and, therefore, a Federal Environmental Impact Study would most likely not be required;
- Kern County does not have a groundwater banking ordinance requiring county permits;
- The Project would not export native groundwater or surface water;
- The Project would be designed to be in compliance with the Kern County groundwater exportation ordinance;
- The Project would be on current agricultural lands (and thus would not require various biological permits);
- The Project is in a sparsely populated rural area; and
- The Project does not have any political “baggage” or bad press to-date.

The following table summarizes the estimated local, state and federal regulatory requirements.

Table 10: Applicable Rules and Regulations

Item	Conclusions
Federal Regulations	
National Environmental Policy Act (NEPA) EIS	No Federal actions that would trigger this act have been identified.
Endangered Species Act (16 USC 1531) Fish and Wildlife Coordination Act(16 USC 661) US Fish and Wildlife Service	The ponds would be built on agricultural land and it is hoped that piping and wells can be placed in existing road and transmission line right of ways. Therefore, it is anticipated that the Service would issue a No Jeopardy Opinion. However, this preliminary conclusion must be screened by a qualified environmental professional in Phase 1.
Clean Water Act Section 404, Section 401, River and Harbors Act Section 10, Federal Executive Order 11990, Army Corps of Engineers	Assuming the layout avoids ephemeral drainages, the Project would not include impact to waters of the United States (including wetlands). It is expected that the Corps would rule that no action or permit is required.
Clean Water Act Section 402 Lahontan Regional Water Quality Control Board	General Construction Activity Storm Water Permit may be required and the Board would review potential groundwater quality impacts in the EIR.
Clean Air Act, Air Pollution Control District	If diesel or natural gas powered pumps are used, the CAA may require a permit for emission of pollutants to the atmosphere.
State Regulations	
California Environmental Quality Act (CEQA) DWR, LADWP, AVEK	EIR is required because project requires DWR, DWP and AVEK approval of turnouts and pump-ins to conveyances controlled by each agency.
California Endangered Species Action California Department of Fish and Game	The ponds would be built on agricultural land and piping/ wells would be placed in road and transmission line right of ways. It is anticipated that the Department would issue a No Jeopardy Opinion. This preliminary conclusion must be screened by a qualified professional. The Los Angeles County Department of Regional Planning issued a report in 2000 recommending that nearby areas be designated as Significant Ecological Areas. The impact of that recommendation must be carefully evaluated.
California Water Code Sections 1700-1746 California State Water Resources Control Board (Division of Water Rights) - DWR	Facility would be permitted independent of specific water rights. 3rd parties contracting to use the facility would be required to perform their own separate analyses of issues relating to place and manner of use.
California Streets and Highways Code Sections 660-734, California Department of Transportation County Road Departments	Encroachment permits would be required for any piping that would pass under State or County roads.
California Health and Safety Code Sections 116275-116750, CA Dept. of Health Services	Aqueduct pump-in systems may require public water system permits since they would be operated to supply M&I uses.
Power grid CEC, CPUC and others	The Project would require installation of new substations from an existing transmission line. Coordination with state agencies is required.
Regional and Local Regulations	
Groundwater exportation, Kern County	Project must comply with groundwater exportation ordinance.
Local rules and regulations	No fatal flaws.
District Regulations, Terms and Conditions for Water Service - AVEK	If the Project includes a pump-in to the West AVEK feeder, agency approval of operations and evaluation of impacts would be required (included in the EIR).
Utility Line Coordination General Orders California Public Utilities Commission (CPUC)	Commission orders would control the placement, construction, maintenance of utility facilities.
DWR Bulletin 74-81, Kern County	Well construction and abandonment
Construction permits and tax assessment	All of the contemplated land is either zoned for agricultural use or is not zoned. While a potential zoning change may be required, this is not anticipated to be a critical issue.
Contracts and Agreements	
Operating Agreements	The lead agency would enter into operating agreements with LADWP, AVEK and DWR for wheeling of water through their systems.
Monitoring Agreement	The lead agency would enter into an agreement with surrounding pumpers. These agreements typically establish a monitoring committee with criteria for shut-down and/or reimbursement of pumpers for increased pumping costs (if any).
In-lieu Agreements	Projects of this type commonly enter into agreements with pumpers to periodically deliver surface water in-lieu of groundwater pumpage, thereby banking and equivalent amount of groundwater. These arrangement reduce farmer costs and CAPEX.
Easement Agreements	The lead agency would enter into agreements with adjacent land owners to allow wells and piping to be installed in and through their properties.
Storage Lease Agreements	The lead agency would enter into long term agreements with 3rd parties to lease storage capacity in the system.

The following tables summarize the Expected, Worst and Best Case critical paths for entitlement and monetization of the Antelope Valley project. The length of this process is a function of the following:

- The drive, desire and clarity of vision of the lead agency;
- The support (or opposition) of surrounding property owners and agencies;
- The ability of the lead agency and WDS to make the Project a "top priority" with other agencies that must provide various permissions and reviews; and
- The ability of the Project to attract grants.

It has been our hard earned experience that upfront consultations and consensus building with key agencies and landowners are <u>essential</u> to success in a reasonable time frame.

Table 11: Expected and Worst Case Critical Path

Elapsed Months	Item
1-6	An agency(ies) would step forward as the lead. WDS would share information developed to-date so that the agency can complete due diligence. Lead agency staff/consultants would review WDS data to verify that there are no fatal flaws.
3-8	The current draft LOI, defining contributions, duties and benefits for the lead agency and WDS would be finalized.
3-8	WDS would work with the lead agency to finalize the scope of the proposed "Project" (as defined by CEQA).
On-going	Work to obtain grant monies (cannot start until project has been formally defined).
3-8	WDS would work with the lead agency to begin negotiations with potentially impacted landowners and agencies regarding monitoring and operating agreements that would protect and benefit their interests.
3-10	WDS would work with the lead agency to identify and begin negotiations with potential non-local tenants that would provide pre-payments to help finance construction.
4-12	Working with lead agency staff/consultants, WDS would help prepare an Initial Study, likely concluding that a CEQA EIR would be required for the following key reasons: • Permissions would be required from LADWP to construct a turnout/pump-in point to Los Angeles Aqueduct Barrel 2 (LAA2) and to alter the manner in which flows are managed in LAA2 and LAA1 at certain times; • Permission would be required from the DWR to construct an interconnection/pump-in point between LAA2 and the California Aqueduct (although WDS believes the LADWP may have plans to build this interconnection themselves); • Permission would be required from the AVEK to construct an interconnection/pump-in point between the Project well field and the AVEK feeder; • Right of way would be required from the County DOT; • There may be conversion of prime farmland (although the Kern County assessor has indicated that periodic organic carrot leases in recharge basins can be used to mitigate this issue) and, as defined by the Assessor's office, water banking is an allowed land use within Zone A areas; • The Project may be perceived as providing growth inducing impacts; • The lead agency would likely be required to add additional equipment and employees to operate the facility – potentially requiring evaluation of public service impacts. Note: <u>WDS has purposefully chosen land that is entirely in agriculture</u> as part of a screening process to prevent significant impact to biological resources. WDS anticipates that an Habitat Conservation Plan (HCP) would not be required, although a qualified biological opinion should be obtained. Costs of the Initial Study not covered by grants (if any) would be carried by WDS. Note: The lead agency may chose to bypass the Initial Study and proceed directly to an EIR.
4-13	WDS would work with lead agency staff to undergo a competitive bidding process for selection of a consultant (contracted to the lead agency) to prepare the EIR.
12-18	Consultant would prepare and the lead agency would circulate the DRAFT EIR, including required hydrogeologic, engineering, cultural, biological and economic evaluations.

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Elapsed Months	Item
12-30	WDS would work with the lead agency to finalize operating and monitoring agreements with surrounding agencies and landowners. This process should be started as early as possible.
31-42	Public review, supplemental work, revisions and certification of the final EIR
33-48	WDS would work with the lead agency to finalize contracts with non-local "tenant" agencies that would make pre-payments on leases to help finance construction.
36-60	WDS would help the lead agency obtain financing for balance of construction funds not covered by pre-payments and grants, if any.
36-60	Lead agency would purchase the required land from WDS.

Table 12: Best Case Critical Path

Elapsed Months	Item
2	An agency(ies) would step forward to participate in the bank. WDS would share information developed to-date so that the agency can complete due diligence. Lead agency staff/consultants would review WDS data to verify that there are no obvious fatal flaws.
3	The current draft LOI, defining contributions, duties and benefits for the lead agency and WDS.
3	WDS would work with the lead agency to finalize the scope of the proposed "Project" (as defined by CEQA).
On-going	Work to obtain grant monies.
3	WDS would work with the lead agency to begin negotiations with potentially impacted landowners and agencies regarding monitoring and operating agreements that would protect and benefit their interests.
3	WDS would work with the lead agency to identify and begin negotiations with potential non-local tenants that would provide pre-payments to help finance construction.
6	Working with lead agency staff/consultants, WDS would help prepare an Initial Study, concluding that there are no significant environmental impacts and resulting in a DRAFT Negative Declaration or Mitigated Negative Declaration. This was the case with the Pioneer and Arvin Edison water banks – both in Kern County.
9	WDS would work with agency consultants to perform supplemental investigations required for preliminary engineering design and financing.
12	WDS would work with the lead agency to finalize operating and monitoring agreements with surrounding agencies and landowners. This process should be started as early as possible.
19	Certification of the Negative Declaration and issuance of affiliated permits.
20	WDS would work with the lead agency to finalize contracts with non-local "tenant" agencies that would make pre-payments on leases to help finance construction.
24	WDS would help the lead agency obtain financing for balance of construction funds not covered by pre-payments and grants, if any.

It should be noted that the Best Case scenario assumes that there are no protests, the various agencies and pumpers place aside current disagreements and that they work together with a sense of urgency. Based on recent developments, this scenario currently seems unlikely.

Entitlement Phases

The development process would includes 5 phases. The first 3 phases conclude at milestones at which expenditures and progress would be assessed to determine if it is appropriate to continue with water bank permitting efforts.

Phase 1: Engage with a Lead Agency: The objectives of this phase would be to have an agency step forward as a willing lead for the Project and secure a contract with that agency for development of the Project.

Phase 2: Initiate Permitting Process and Pursuit of Grants: The objective of this phase would be to establish the Project on agency agendas and verify that it can be permitted in an acceptable time frame. Work would include:

- Developing agreements with agencies such as LADWP, AVEK, AVSWC, and/or DWR for use of existing conveyances;
- Working with the selected lead agency, performing required investigations, preparing a draft EIR and submitting for non-lead agency and public comment; and
- Filing for grant monies on behalf of the local agency.

During this phase, WDS expects that significant comments would be received from the following entities:

- AVEK regarding wheeling in conveyances;
- LADWP regarding wheeling in conveyances;
- Surrounding pumpers, particularly those that have filed lawsuits;
- Kern County Water Agency regarding the groundwater exportation ordinance;
- MWD regarding wheeling capacity and water quality impacts to State Water Project (SWP) water;
- DWR regarding interconnection to the East Branch of the California Aqueduct;

Phase 3: Supplemental Investigations: Assuming that the team proceeds with water bank efforts, the objective of this phase would be to collect supplemental data required by non-lead agency and public comments.

Phase 4: Obtain Permits and Certified EIR: The objective of this phase would be to obtain a certified EIR and finalized Operational MOU and Right-of-Way (ROW) agreements.

Phase 5: Financing, Sale of Property to Lead Agency and Leasing of Capacity: Following certification of the EIR, the lead agency would take ownership of land and begin leasing excess storage capacity to finance construction.

Entitlement Tasks

The development budget presented in a following section divides expenditures into the following tasks:

- Public relations and lobbying;
- Creation of legal documents;
- On-going water level monitoring;
- Land surveys and mapping;
- Preliminary engineering;
- Hydrogeologic investigations;
- Modeling;

- Biological surveys;
- Environmental Impact Report; and
- Local permitting.

The following sections provide details regarding these tasks.

Public Relations and Lobbying: This task would entail the following work:

- Regular attendance and record keeping at a variety of meetings throughout the state;
- Upfront efforts to align local agencies in favor of the Project;
- Efforts to introduce the local agencies to non-local banking participants and educate the parties;
- Efforts to gain high priority ranking in grant applications;
- Efforts to align surrounding land owners in favor of the Project;
- Efforts to align the DWR and LAWDP in favor of the Project; and
- Efforts to align various environmental groups in favor of the Project.

These efforts would occur at irregular intervals throughout the entitlement process, with the majority of work in the early months and following completion of the draft EIR.

Creation of Legal Documents: This task would entail the following work:

- Preparation of an agreement between WDS and the lead agency;
- Preparation of agreements between the lead agency, LADWP and AVEK;
- Preparation of agreements with surrounding landowners, potentially including easements;
- Preparation of storage lease agreements with banking participants;
- Preparation of various consultant contracts; and
- Periodic legal evaluations/opinions regarding water, land and permitting issues.

These efforts would occur at irregular intervals, with the majority of work in the beginning, immediately preceding draft EIR issuance and immediately following final EIR issuance. The lead agency agreement would define contributions and responsibilities, and compensation as previously summarized. In order for the lead agency to enter into an agreement, it would likely undergo a process that includes:

- A board resolution that it is willing to contemplate being the lead agency for the Project;
- Initial discussions on general structure;
- Submission of a non-binding letter of intent including a term sheet with dollar figures and percentages left blank;
- Negotiation of the dollar figures and percentages;
- Due diligence to verify that the Project is technically, financially and politically viable;
- Development of a CEQA project description that may be an attachment to the WDS agreement;
- 5-10 iterations of review and revision; and
- Approval of agreement by the Board, potentially including a validation process.

As indicated above, the lead agency would need to undergo due diligence to confirm that the Project would be technically, financially and politically viable. In addition, the agency would need to confirm that there is adequate “desire” for the Project to justify agency expenditures and energy. To a large degree this would be an educational process and for budgeting purposes, WDS has assumed that the majority of 3rd party due diligence costs would be carried by WDS (to facilitate the process). In addition, WDS has assumed that due diligence would be led by an assigned committee that would report back to the board with recommendations.

Ongoing Water Level Monitoring: This task would define the baseline groundwater levels prior to project implementation. This baseline is required to gage the degree of impact on surrounding landowners after the facility is brought into operation. Work entails obtaining access to private wells, driving to those wells on a pre-arranged schedule to make measurements, and entry of measurements into a project database. The number of wells and frequency of measurement would be largely dictated by the number of interested surrounding landowners during a semi-public process that the lead agency would enter into soon after it is announced that they are pursuing the Project.

Land Surveys and Mapping: The purpose of this task would be to provide the engineers, hydrogeologists and agencies with a detailed base map that would be used in modeling, planning, habitat evaluation and engineering efforts. This task would likely include aerial photography, a ground-truth survey to tie-in elevations, GPS location of all wells within about 5-miles (including inspection of condition) and incorporation into a geographic information system (GIS).

Preliminary Engineering: This task entails 2 parts:

- A feasibility study to confirm the technical and economic viability of the Project (essentially a repeat of this report by an objective consultant); and
- Preliminary (20%) engineering design/cost estimation to be used in EIR, financing and contracting (again, an extension of the work already performed by WDS).

Hydrogeologic Investigations: This task would be an extension of WDS fatal flaw investigations to allow more precise prediction of performance and impact. This work varies from project to project, but typically includes the following:

- additional trenching with soil analyses;
- additional borings with geophysical logging;
- installation of monitoring wells;
- water analyses;
- a 3-6 month pilot recharge test (with intensive water level and quality monitoring; and
- aquifer/well tests to evaluate the variability of well performance.

Modeling: The purpose of this task is to provide technically defensible estimates of the following:

- recharge and recovery efficiencies and schedules;
- the rise in water table as a consequence of recharge;
- the fall in the water table as a consequence of extraction;
- the amounts of "unrecoverable" water;
- the speed at which the mound migrates away from recharge basins;
- the degree to which the mound would be "mined" by surrounding agricultural pumpage; and
- the change in groundwater quality over time as recharged water mixes with native groundwater.

Biological Surveys: WDS has carefully chosen this project location to minimize impact on native habitats – commonly a significant impediment to the permitting process. While WDS anticipates that California Fish & Game (F&G) involvement would be minimal, a certain amount of work by a qualified biological consulting firm would be required to verify that endangered, protected or special status species would not be harmed by this project.

Environmental Impact Report (EIR): EIR's include analysis of direct impacts, indirect impacts, short and long-term impacts, irreversible environmental change, growth inducing impacts, cumulative impacts, economic and social effects, agricultural impacts, historical resources, archeological resources, and a variety of other issues associated with the burden on the community. The analysis must include review of alternatives to the proposed project – a complicated and somewhat political process. Finally, the EIR must determine the methods that would be used to mitigate impacts that are found to be significant. Taken together, the EIR process usually entails the following elements:

- 6-9 months of draft EIR preparation by a consultant;
- 3-6 months of agency and public review – commonly resulting in the need to perform supplemental investigations, modeling and analysis; and
- Numerous meetings, negotiations consultations and presentations (attended by the consultant) following by an expensive publication process.

Local Permitting: Aside from the EIR, the Project would likely require permits/permissions from the Regional Water Quality Control Board, Kern County DOT and various utility companies. All of these permits/permissions would be subordinate to the EIR and can hopefully be deferred until the detailed design-construction stage (thereby deferring these costs to the financing that would be performed by the lead agency). However, WDS felt it prudent to assume that a certain amount of coordination would be required to ensure that these entities are informed and do not raise potentially fatal objections. Therefore, WDS has included costs for consultants to review easements, agency files, prepare summary documents, fill out various County forms, and attend key meetings with WDS.

Soils and Hydrogeology

The west end of the Antelope Valley basin is bounded by the Tehachapi Mountains on the north and the San Gabriel Mountains on the south – with these two features converging to form a triangular shaped western terminus at the Sierra Pelona Range. The Antelope Valley is a graben, or an area that has dropped downward due to movement on the San Andreas and Gerlock faults that bound it. Over time the basin has filled with several thousand feet of alluvial materials that have eroded from the bounding mountain ranges. The aquifer which is the primary source of water for irrigators and within which the Project would store water is within these alluvial sands and gravels.

The basin is sub-divided into 12 sub-basins that are defined by faults that generally have no surface expression (Figure 12). The locations of these faults have been estimated largely through discontinuity of water levels caused by relatively low permeabilities of the fault zones. While these fault zones are not impermeable, they apparently cause some restriction of water flow between the sub-basins. The Neenach Sub-Basin is a 78 square mile triangular area defined by the Neenach, Rosamond and Randsburg-Mojave faults (Figure 12). Prior to commencement of significant pumpage for irrigation in the early 1900's, the water table was 150 to 20 feet, bgs. By the mid-1970's the water table had dropped to approximately 350 feet, bgs. Since that time water levels have stabilized as delivery of SWP water by AVEK has partially replaced groundwater pumpage. DWR data and recent modeling by the USGS indicate that the target area has reached an equilibrium, with water table levels varying little from year to year. The Project would store water in the 150 to 200 foot thickness of aquifer above the current water table that was dewatered by historic overpumpage. WDS and others estimate that there is at least 500,000 AF of storage space available. The Neenach Sub-Basin is highly transmissive, wells consistently yield more than 1,000 gpm and the water quality is excellent. WDS estimates that the target parcels could support at least 0.5 feet/day (likely greater than 1.0 feet/day) of recharge totaling at least 100,000 AF/year. Evaporative and aquifer losses would likely vary from 5% to 15%. These estimates are consistent with earlier estimates by Psomas (1998) and Hydroscience (1998).

SWP water has been applied to the target areas for 30-years and would not pose a problems from a technical or regulatory view point. Owens Valley water from LAA#2 has historically contained arsenic but since 1996 concentrations have been below 10 ug/l and commonly below 5 ug/l - careful monitoring would be required.

Previous Work

Previous investigations into recharge and water banking in the west end of the Antelope Valley have included the following:

- US Soil Conservation Service (USCS), which pilot tested a recharge basin in 1946-47;
- US Geological Survey (USGS,1967);
- DWR (1976-1979);
- USGS (1984)
- AVEK-Mojave Water Agency through Kennedy & Jenks (1997-1998);
- Western Water-Psomas (1998);

- Integrated Water and Hydroscience (1998);
- Tejon Ranch through Boyle Engineering (1999); and
- USGS (2003).

Some of the efforts cited above included modeling and compilation of data from irrigation wells. However, none of these efforts included field investigations (with the exception of the USCS). However, all of these previous efforts (except the 1946 pilot test) ended before fieldwork could be performed. Additional hydrogeologic studies that provide useful information on the target area are listed in the bibliography at the end of this report.

Climate, Surface Water and Recharge

The USGS (1967, 1978 and 1987) indicates that the target area receives an average of less than 10 inches/year (0.83 feet/year) of precipitation with an average annual potential evapotranspiration (Pan A) of 114 inches/year (9.5 feet/year). A review of monthly records indicates that monthly evapotranspiration always exceeds precipitation. This finding comfirms the general concept that there is little or no recharge from direct precipitation in the target area.

As indicated in previous sections, there are no perennial streams in the target area, but it does lie within the distributary fan of ephemeral Cottonwood Creek which drains from the Tehachapi Mountains and has an average discharge into the basin of about 10 AF/year (USGS 1987). Parts of the target property have been bermed to capture these waters when they periodically occur.

A portion of irrigation water has been assumed by various parties to deep percolate into the aquifer. The USGS (2003) estimated that up to 30% of the applied irrigation water (either pumped groundwater or AVEK surface water) is ultimately recharged back into the aquifer. At an average applied water rate of 2.6 AF/year (USGS 2003), this would translate to 0.8 feet/year of recharge from irrigation. WDS calculations using draft applied water estimates by the DWR for the State Water Plan Update indicate deep percolation ranging from 0.5 to 1.3 feet/year. USGS (1978) estimated that the combined recharge from runoff and deep percolation was less than 0.8 feet/year.

Near Surface Soils

For the purposes of this evaluation, WDS classified near surface soils as the materials within 16 feet of the ground surface (the reach of a backhoe). The following table summarizes soil information from the document, “Soil Survey of Antelope Valley Area published by the U. S. Department of Agriculture, Soil Conservation Service (SCS, 1970) and from sieve analyses performed on soils collected from trenches and borings performed for WDS by Layne.

Table 13: Average Target Parcel Soils (upper 16 feet, bgs)

Soil	Cajon Loamy Sand	Hesperia Loamy Fine Sand		Hesperia Fine Sandy Loam		Rosamond Loamy Fine Sand		Rosamond Fine Sandy Loam	Rosamond Loam
Map Symbol	CaC (556)	HgA (469)	HgA2 (526)	HkA (521)	HkB (484)	Rm (587)	Rm2 (631)	Ro (496)	Rp (498)
Acres	1	182	81	274	103	272	33	437	254
% of total acreage	<1%	11%	5%	17%	6%	17%	2%	27%	15%
Unified	SW-SP	SM-GM	SM	SM-GM	SM-GM-GP	SM	SM	SM-GM	SM
Passing #4	97%	98%	97%	99%	96%	100%	97%	97%	95%
Passing #10/12	95%	92%	97%	94%	90%	97%	93%	90%	89%
Passing #40	45%	59%	70%	63%	65%	80%	63%	63%	62%
Passing #200	5%	10%	20%	15%	20%	34%	22%	15%	17%
Plasticity Index	NP	NP	NP	NP	NP	NP	NP	0-5	0-5
Avg. % Clay	1%	3%	3%	3%	3%	<16%	<16 %	<16%	<16%
SCS K (ft/day)	13-40	13-40	13-40	4-13	4-13	4-13	4-13	1-4	1-4
Rosetta K (ft/day)	NA	13-25	13-25	4-20	1-16	2-4	2-4	3-17	7
Rosetta Specific Yield	33%	33%	33%	33%	33%	33%	33%	33%	33%
Salinity (mmhos/cm)	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2	0-2
Notes									
Minimum percolation test rate	NA	21.1 ft/day at 171 minutes	NA	2.3 ft/dy at 361 minutes	5.9 ft/dy at 415 minutes	5.3 ft/dy at 361 minutes	NA	9.2 ft/day at 108 minutes	3.7 ft/dy at 1,323 minutes

NP: non plastic
NA: not available
SW: well graded sands and gravelly sands
SM: silty sands
SP: poorly graded sands and gravelly sands
GM: silty gravels
GP: poorly graded gravels
SCS K (ft/day): Soil Conservation Service average saturated hydraulic conductivity in feet/day – regional values
Rosetta K (ft/day): Saturated vertical hydraulic conductivity estimated by WDS from sieve analyses using the US Salinity Laboratory software Rosetta
Rosetta Specific Yield: Specific yield estimated by WDS using the software Rosetta.

Figure 14 depicts the distributions of soil types. Appendix C includes trench logs, percolation test results and sieve analyses.

Hydrogeologic Units and Aquifer Characteristics

As indicated on Figure 13, surface geologic materials in the Neenach Sub-Basin generally consists of Quaternary Alluvium (Qyd) comprised of unconsolidated sand, gravel and boulders containing small quantities of clay. The USGS (1967) indicates that Qyd averages 100 feet thick and unconformably overlies an older Quaternary Alluvium (Qoa) consisting of poorly sorted sand with some gravel, silt and clay. In general, the water table resides in Qoa

forming the uppermost, unconfined aquifer and supporting relatively prolific wells (see following section). Bloyd (1967) indicated that surface materials in the target area may in fact be Qoa.

In other parts of the basin Qoa is underlain by lacustrine clays that separate the uppermost aquifer from a deeper, confined aquifer. However, all references agree that this clay is absent in the Neenach Sub-Basin although there is an increase of clay content with depth. Geologic materials encountered by Layne in the three boreholes advanced for this project (398, 438 and 478 feet deep) were consistent with these literature descriptions. In general, the borings encountered interbedded sands, gravels, silts, and to a lesser degree, clays. The upper 200-225 ft of each test hole was coarser-grained than the lower portions, although the overall textural classification of the samples from each test hole was predominately sand. Layne did not encounter any substantial, laterally continuous clay or silt layers above the water table that would impede downward percolation of recharge water. Layne boring logs are presented in Appendix D. The following table summarizes aquifer characteristics cited in various references and as estimated by WDS.

Table 14: Aquifer Parameter Estimates

<table>
<tr><th>Source</th><th>Transmissivity (ft^2/day)</th><th>Saturated Thickness (ft)</th><th>Horizontal Hydraulic Conductivity (ft/day)</th><th>Vertical Hydraulic Conductivity (ft/day)</th><th>Specific Yield (%)</th></tr>
<tr><td>DWR (1977)</td><td>NE</td><td>1,150</td><td colspan="2" rowspan="3">NE</td><td>20%</td></tr>
<tr><td>USGS (1978)</td><td>14,000</td><td></td><td>20%</td></tr>
<tr><td>USGS (1987)</td><td>NE</td><td>1,250-1,700</td><td>NE</td></tr>
<tr><td>Psomas (1998)</td><td>>10,400</td><td>1,500</td><td>10-24
24 most likely</td><td>5-12
12 most likely</td><td>20%</td></tr>
<tr><td>Hydroscience (1998)</td><td colspan="2" rowspan="4">NE</td><td>NE</td><td>1-3</td><td>NE</td></tr>
<tr><td>USGS (2003)</td><td>30</td><td>0.3</td><td>14%</td></tr>
<tr><td>WDS Rosetta (2003) above the water table</td><td>23</td><td rowspan="2">NE</td><td>34%</td></tr>
<tr><td>WDS Rosetta (2003) below the water table</td><td>20</td><td>33%</td></tr>
<tr><td>Range</td><td>10,400 – 14,000
Likely: 14,000</td><td>1,150 – 1,700
Likely: 1,500</td><td>10-30
Likely: 25</td><td>0.3 - 3.0
Likely: 2.5</td><td>14% - 33%
Likely: 20%</td></tr>
</table>

Estimates are for the target area unless otherwise stated
NE: not estimated

USGS (1987) estimated that the Qoa extends downward 1,600 to 1,900 feet, bgs to pre-Tertiary plutonic granite and volcanic basement rocks, providing a saturated thickness of 1,250 to 1,700 feet (1987, conditions have not changed significantly since that time). In contrast, the depth to bedrock immediately east, on the up thrown side of the Neenach Fault (within the Lancaster Sub-Basion) was estimated to be only 700 to 750 feet, bgs with a saturated thickness of less than 500 feet. Likewise, the depth to bedrock immediately west, on the up thrown side of the Randsburg-Mojave Fault (within the Finger Buttes Sub-Basin) was estimated to be less than 1,200 feet with a saturated thickness of less than 750 feet. Varies studies consistently indicate that the Neenach Sub-Basin has higher transmissivities than the adjacent sub-basins, largely because of the greater saturated thickness.

Recent modelling by the USGS (2003) suggests that the hydraulic conductivities of the Neenach and Randsburg-Mojave Faults may range as follows:

- Estimated Neenach Fault hydraulic conductivity: 0.008 to 0.04 feet/day; and
- Estimated Randsburg-Mojave Fault hydraulic conductivity: 0.0002 to 0.0007 feet/day.

Depth to Groundwater, Subsidence and Directions of Groundwater Flow

In the early 1900's the water table beneath the target area was 150 to 200 feet below ground surface. Agricultural pumpage lowered the water table until AVEK began importing SWP surface water in 1974 (causing a decrease in groundwater pumpage). As a result, water levels stabilized in the mid-1980s. Figure 8 depicts this water level trend in well 09N14W20B001S, located approximately 1-mile north of the target area. The water table now averages 341 feet below ground surface, with seasonal variations of 5 to 20 feet. The Project would store imported surface water in the 150 to 200 feet of dewatered space above the current water table. Additional water might be stored in shallower materials that were not historically below the water table (potentially doubling storage space), although geochemical investigations would be required to determine suitability of these shallower materials.

The USGS (2003) estimates that if groundwater pumpage did not increase over 1995 levels, the water table would recover about 10 feet in the target area over the next 20-years. Other model runs in that same study estimate that the water table would remain fairly static at current levels if irrigation pumpage grew at a rate of 3% per year over the next 20-years. This combination of currently stable water levels plus likely continued future stable water levels would provide an excellent baseline condition for tracking water bank impacts.

Figure 17 depicts the estimated thicknesses of dewatered aquifer in which water would be stored. Figures 15 and 16 are water table contour maps from 1915 and spring 1996. As indicated, while the water table dropped during the intervening 81-years, the direction of groundwater flow in the target area has remained fairly consistent from the southwest to the northeast.

The USGS (2003) indicated that there was no measurable subsidence in the target area between 1930 and 1992 – supporting the concept that the lacustrine clays are absent and the aquifer is unconfined.

Well Production Rates

Wells within the target area are usually perforated from 250 to 1,000 feet, bgs and support flows of 1,000 to 2,000 gpm with an average of 1,500 gpm (based on review of records from 19 wells). Well specific capacities range from 20 to 60 gpm/foot of drawdown, with values of 50 gpm/foot being typical for the target area (USGS, 1987). These specific capacities (from relatively inefficient irrigation wells) indicate that flows of over 3,000 gpm could be achieved in area where recharge has substantially raised the water table.

Groundwater Quality

All reports reviewed by WDS consistently indicated that groundwater quality in the Neenach Sub-Basin is good, with TDS concentrations less than 400 mg/l. However, WDS was unable to find any study that had analyzed groundwater samples for a complete suite of drinking

water and ionic parameters. Therefore, Layne collected and analyzed the six groundwater samples summarized on Table 15 (locations indicated on Figure 4). Key findings of those analyses were as follows:

- *No contaminants detected in irrigation wells*: Wells T9NR15W-25F and T9NR15W-30K were sampled on June 10, 2003 by Layne. The unfiltered samples were analyzed for Title 22 parameters plus major ions. As detailed on Table 15, results were as follows:
    - Nitrate: 2.3-2.5 mg/l (CA MCL: 10-45 mg/l);
    - Total dissolved solids (TDS): 180-210 mg/l (CA SMCL: 500-1,000);
    - Total organic carbon: <0.7 mg/l;
    - Arsenic: <2.0 ug/l;
    - Chromium: 9.7-16 ug/l (CA MCL: 50 ug/l);
    - Lead: <5 ug/l;
    - Selenium: <5 ug/l;
    - Volatile organic compounds: non-detect;
    - Semi-volatile organic compounds: non-detect;
    - PCBs: non-detect;
    - Herbicides: non-detect;
    - Pesticides: non-detect;
    - Gross alpha: 3.1-6.56 pCi/l (CA MCL: 15 pCi/l);
    - Diquat: non-detect; and
    - Asbestos: non-detect.
- *No contaminants detected in groundwater samples from undeveloped boreholes*: Borings B-3 and B-4 (Figure 4) were sampled on July 25 and August 1, 2003 respectively by Layne. Each sample was divided into an unfiltered and a filtered aliquot. The unfiltered aliquot was analyzed for inorganic Title 22 parameters and major ions. The filtered aliquot was analyzed for a select sub-set of parameters. As summarized below (and detailed in Table 15) slightly elevated concentrations of arsenic, chromium and lead were detected in the unfiltered aliquots. However, these analytes were not detected in the filtered analytes which removed significant levels of suspended formation material and drilling mud (see turbidity and suspended solids results from unfiltered aliquots). Based on these results and those from the irrigation wells, WDS has concluded that arsenic, chromium and lead would not be detected at significant concentrations in properly installed and developed recovery wells.
    - Unfiltered nitrate: 9-11 mg/l (CA MCL: 10-45 mg/l);
    - Unfiltered TDS: 200-240 mg/l (CA SMCL: 500-1,000);
    - Unfiltered Total suspended solids: 460-3,600 mg/l;
    - Total organic carbon: 2.1-3.9 mg/l;
    - Unfiltered turbidity: 990-2600 NTUs;
    - Unfiltered arsenic: 5.4-8.5 ug/l;
    - Filtered arsenic: <1 ug/l;
    - Unfiltered chromium: 57-82 ug/l (CA MCL: 50 ug/l);
    - Filtered chromium: <5 ug/l (CA MCL: 50 ug/l);
    - Unfiltered lead: 9.3-13 ug/l;
    - Filtered lead: <5 ug/l; and
    - Unfiltered selenium: <5 ug/l.

Table 15: Water Quality Data

Parameter	Units	Station Well	Field Well	Boring Van Dam #3	Boring Van Dam #3	Boring Van Dam #4	Boring Van Dam #4	USEPA MCL	CA MCL	CA DHS PHG	USEPA Secondary MCL
Lab ID		A3F0436-01	A3F0436-02	CMG0155-01	CMG0155-01	CMH0004-01	CMH0004-01				
Latitude		N34deg50.441'	N34deg50.460'								
Longitude		W118deg24.264'	W118deg25.398'								
Filtered?		**NO**	**NO**	**NO**	**YES**	**NO**	**YES**				
Total Hardness	mg/l	52	85	130		180					
Calcium	mg/l	17	28	31	19	35	18				
Magnesium	mg/l	2	3.6	13	2.3	22	2.1				
Sodium	mg/l	36	30	36	34	36	33				
Potassium	mg/l	1.8	1.9	5.1	2.2	6.6	2.3				
Total Alkalinity	mg/l	98	120	110		130					
Hydroxide	mg/l	<3	<3.0	<2		<2					
Carbonate	mg/l	<3	<3.0	8		<2					
Bicarbonate	mg/l	120	150	100		130					
Sulfate	mg/l	12	13	14		24					250
Chloride	mg/l	8.9	8.9	8.2		11					250
Nitrate	mg/l	2.3	2.5	9		11		10	10-45	10-45	
Fluoride	mg/l	0.3	0.2	<0.5		<0.5		4	2	1	2
pH	units	8.1	7.9	8.05		7.84		6.8-8.5			
Specific Conductance	umhos/cm	280	320	260		320					
Total dissolved solids	mg/l	180	210	200		240					500
Total suspended solids	mg/l	<5	<5	460		3600					
Total organic carbon	mg/l	<0.7	<0.7	2.1		3.9					
Color	Units	3	3	19		19					15
Odor	TON	<1	<1	<1		<1					3
Turbidity	NTUs	1.5	1.9	990		2600					
MBAS (foaming agents)	mg/l	<0.05	<0.05	<0.4		<0.1					0.5
Cyanide	mg/l	<0.1	<0.1	<0.025		<0.025		0.2	0.15	0.15	
Nitrite as N	mg/l	<0.1	<0.1	<0.15		0.17		1	1	1	
Total phosphorous	mg/l	<0.05	<0.05	0.15		1.1					
Aluminum	ug/l	<50	<50	240	<50	39000	<50	50 to 2000	1000	600	50-200
Antimony	ug/l	<6	<6.0	<2	<2	<2	<2	6	6	20	
Arsenic	ug/l	<2	<2.0	5.4		8.5	1.4	10	Pending	0.004	
Arsenic (filtered)	ug/l	2	<2.0		<1						
Barium	ug/l	<100	<100	180	36	250	30	2000	1000	700	
Berylium	ug/l	<1	<1	0.67	<0.5	0.92	<0.5	4	4	1	
Boron	ug/l	<100	<100	<50	<50	<50	<50				
Cadmium	ug/l	<1	<1	<1	<1	<1	<1	5	5	0.07	
Total chromium	ug/l	16	9.7	57	<5	82	<5	100	50		
Hexavalent chromium	ug/l	16	9.7	<1		<10		100	50		
Copper	ug/l	21	<10	44	<10	56	<10	1300	1300	170	1000
Iron	ug/l	110	42	35000	<40	56000	<40				300
Lead	ug/l	<5	<5.0	9.3	<5	13	<5	15 (90%)	15 (90%	2	
Manganese	ug/l	<5	<10	620	57	1100	25				50
Mercury	ug/l	<1	<1.0	1.3	<0.2	1.9	<0.2	2	2	1.2	
Nickel	ug/l	<10	<10	43	<10	65	<10		100	12	
Selenium	ug/l	<5	<5.0	<5	<5	<5	<5	50	50		
Total silica	ug/l	18	23	60000	8700	50000	5000				
Silver	ug/l	<10	<10	<10	<10	<10	<10				100
Thallium	ug/l	<1	<1.0	<1	<1	<1	<1	2	2	0.1	
Zinc	ug/l	<10	<10	67	<20	120	24				5000
Organics	ug/l	ND	ND	NA	NA	NA	NA				
Ethylene dibromide	ug/l	ND	ND	NA	NA	NA	NA				
Dibromochloropropane	ug/l	ND	ND	NA	NA	NA	NA				
Aldicarb	ug/l	ND	ND	NA	NA	NA	NA				
Aldicarb sulfone	ug/l	ND	ND	NA	NA	NA	NA				
Aldicarb sulfoxide	ug/l	ND	ND	NA	NA	NA	NA				
Carbaryl	ug/l	ND	ND	NA	NA	NA	NA				
Carbofuran	ug/l	ND	ND	NA	NA	NA	NA				
Methomyl	ug/l	ND	ND	NA	NA	NA	NA				
Oxamyl	ug/l	ND	ND	NA	NA	NA	NA				
Glyphosphate	ug/l	ND	ND	NA	NA	NA	NA				
Endothal	ug/l	ND	ND	NA	NA	NA	NA				
Nitrogen-phosphorous based pesticides via EPA Method 507 (13 compounds)	ug/l	ND	ND	NA	NA	NA	NA				
Organochlorine based pesticides and PCBs via EPA Method 508 (14 compounds)	ug/l	ND	ND	NA	NA	NA	NA				
Chlorinated herbicides via EPA Method 515.3 (8 compounds)	ug/l	ND	ND	NA	NA	NA	NA				
Volatile organic compunds via EPA Method 524.2 (68 compounds)	ug/l	ND	ND	NA	NA	NA	NA				

CA DHS PHG: California Department of Health Services Preliminary Health Goal
USEPA MCL: United States Environmental Protection Agency Maximum Contaminant Level for public water supplies
CA MCL: California Maximum Contaminant Level for public water supplies
ND: not detected
NA: not analyzed

Estimated Recharge Rates

Recharge rate is controlled by the vertical hydraulic conductivity of unsaturated soils above the water table and depth to water. Most banks can tolerate the presence of discontinuous silt and clay layers at depth because recharged water can move around these features as long

as they are not laterally extensive. However, near surface soils (e.g. the upper 15 feet) should be reasonably permeable because the cost to excavate large areas is usually cost-prohibitive. As a result, WDS analyzed recharge rates as follows:

1) WDS estimated vertical hydraulic conductivities of near surface soils using results from sieve analyses and the US Salinity Laboratory software program Rosetta. These results were compared to estimates by others;
2) During the early stages of recharge, water percolates under a unit gradient (assuming 100% saturation) and thus (using Darcy's equation) the maximum theoretical percolation rate (not seepage velocity) is equivalent to the saturated vertical hydraulic conductivity. The values derived in Step 1 were then set as the upper limits to recharge;
3) Percolation rates decrease exponentially over time due to three factors:
    - Percolating water can encounter various lower permeability materials which impede flow, cause localized perching and resulting in a reduction of the vertical hydraulic gradient as water moves laterally around the perching layer;
    - The water table rises resulting in a reduction in the vertical hydraulic gradient as percolating water is forced to move laterally. At some distance from the center of the pond the change in gradient is so low that the spread of the mound effectively stops and the water table backs up to the surface, halting recharge operations; and
    - Over time, soil pore spaces can become occluded by fine sediments, air bubbles and algae/bacterial growth, reducing hydraulic conductivities.

4) Glover (1960) developed an analytical method for estimating the evolution of a recharge mound. The Glover method was validated at various recharge sites in the Central Valley and by WDS at the Madera Ranch site. Therefore, the Glover method (as further detailed in ARD 41-161) was used by WDS to provide screening estimates of mound height and time to cessation of recharge operations. These estimates should be considered a first approximation only, subject to more detailed hydrogeologic investigations and modelling.

Maximum Percolation Rate Estimates

The following table summarizes estimated maximum percolation rates derived from a variety of sources.

Table 16: Estimated Maximum Percolation Rates (feet/day)

Source	**Cajon Loamy Sand**	**Hesperia Loamy Fine Sand**		**Hesperia Fine Sandy Loam**		**Rosamond Loamy Fine Sand**		**Rosamond Fine Sandy Loam**	**Rosamond Loam**
Map Symbol	CaC (556)	HgA (469)	HgA2 (526)	HkA (521)	HkB (484)	Rm (587)	Rm2 (631)	Ro (496)	Rp (498)
SCS	13-40	13-40	13-40	4-13	4-13	4-13	4-13	1-4	1-4
WDS Rosetta	NA	13-25	13-25	4-20	1-16	2-4	2-4	3-17	7
WDS percolation test	NA	21.1	NA	2.3	5.9	5.3	NA	9.2	3.7
USGS	0.2 to 15, mid-range of 3								
Range	**0.2 to 40, geometric mean of 7**								

K: hydraulic conductivity
NA: not available
USGS: 2003
SCS: 1981
Rosetta US Salinity Laboratory software Rosetta

As indicated above, estimated maximum percolation rates vary over a wide range depending on the near surface soil type and the precision of the method used. It has been the experience of WDS and others that the maximum percolation rate should be at least 0.5 feet/day to support long term (lower) percolation rates that are still economically viable. As indicated above, the geometric mean of estimated maximum percolation rates is 7 feet/day with only one (very regional, not based on target area data) estimate of less than 0.5 feet/day. Based on this finding, WDS concluded that near surface soils in the target area are suitable for long term recharge.

Long Term Recharge Estimates

As indicated above, percolation rates decline over time due to perching on lower hydraulic conductivity layers, evolution of the recharge mound and clogging of soil pore spaces. A review of the Layne boring logs in Appendix D indicates that no significant low permeability layers were encountered between the surface and the water table – eliminating significant perching as a potential limiting factor for recharge operations in the target area.

WDS estimated how mound evolution would limit recharge operations by implementing the Glover method using the following key assumptions.

Table 17: Key Assumptions and Results of Screening Mounding Analysis

Parameter	Conservative	Realistic	Liberal	Maximum
Key Assumptions				
Active pond area (acres)	1,426			
Width of recharge basin (ft)	8,000			
Typical recharge season (months)	5			
Aquifer operation	Recharge mound not permitted to rise above the historical 1915 water table (150 to 200 ft, bgs)			Recharge mound permitted to rise within 20 ft, bgs
Average long term infiltration rate (ft/day)	0.24 (3% of starting rate)	0.5 (7% of starting rate)	1.0 (14% of starting rate)	
Aquifer horizontal K (ft/day)	10	25	30	
Pre-project saturated thickness of aquifer (ft)	1,150	1,500	1,700	
Specific yield (%)	14%	20%	33%	
Thickness of dewatered aquifer in which water would be stored (ft)	141	166	191	330
Depth to static water table (ft, bgs)	331	341	350	
Seasonal water table variation absent the Project (ft)	10	12.5	20	
Results				
Volume recharged (AF)	51,336	106,950	213,900	256,680
Does water table rise to the historically shallowest water table?	Yes, within 4 months	No	Yes, within 5-months	No
Months of additional operations that could have occurred if water was available (months)	0	1	0	12
Radial distance of water table impact (miles)	1.1	1.7	1.3	1.5

Key findings summarized in Table 17 were as follows:

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- Water banks typically perform recharge operations within a 4-6 month window (commonly 5-months from November through March). There was no simulation in which the mound rose sufficiently to limit recharge operations within this time-frame;
- Simulations conservatively assuming that water levels are not allowed to rise above the historical water level indicate that recharge could be performed over a 4 to 6-month period before the mound rose to historical water table levels;
- Simulations that more realistically allow the water level to rise above the historical water table level indicate that recharge could be performed for up to 17 months before shallow mound conditions would limit operations;
- The most conservative simulation indicated a minimum recharge capacity of 51,336 AF over 4-months. All other simulations indicate more than 100,000 AF of recharge capacity over 5-months; and
- All simulations indicate that there would be a measurable rise in the water table for distances of 1 to 2 miles from the recharge ponds during the first year of operation.

Hydroscience modelled potential recharge and recovery operations in the target area in 1998 using the USGS groundwater flow model MODFLOW (Appendix E). While that work has not been published or validated by WDS, it is useful to note that their conclusions were similar to those of WDS as follows:

- Annual recharge operations of at least 6-months would be feasible. WDS found that at least 4-months would be feasible (with 6-months likely); and
- In year 1 the water table would rise approximately 137 feet. WDS estimated a water table rise of 136 feet (likely case).

Taken together, screening calculations indicate that the target area is likely able to support recharge operations of at least 50,000 AF/year, but likely greater than 100,000 AF/year, assuming a 5-month recharge window. Within this time frame, recharge operations would likely not be limited by evolution of a shallow water table. By the end of the first recharge season the water table mound would likely extend 1 to 2 miles from the recharge ponds.

Estimated Storage Space

Figure 18 depicts the estimated extent of the recharge mound under various long-term scenarios. The depicted extents are based on a qualitative melding of results from the Glover method analysis (see previous section), review of USGS potentiometric surfaces, pumping center locations, topography and known bounding faults. Table 18 combines the recharge mound configurations depicted on Figure 18 with assumed aquifer parameters to provide estimates of available storage space.

Table 18: Storage Space Estimates

Scenario	Area over 100 ft of dewatered aquifer (acres)	Area over 150 ft of dewatered aquifer (acres)	Area over 200 ft of dewatered aquifer (acres)	Specific Yield (%)	Storage Space (AF)	% of Available Basin Storage (%)
WDS Estimates						
Conservative	0	10,172	0	14%	213,612	15%
Likely	**0**	**14,528**	**5,156**	20%	**642,080**	**45%**
Liberal	0	19,450	8,301		915,540	64%
Maximum	1	23,162	8,577		1,037,960	72%
Entire Neenach Sub-Basin	14,128	26,787	8,855		1,440,370	100%
Estimates by Others						
Psomas (1998)	Approximately the target area of Neenach Sub-Basin: 550,000 AF					

As indicated above, WDS estimates a likely available storage space of 642,080 AF. This estimate compares well with a Psomas (1998) estimate of 550,000 AF.

Evaporative and Other Losses

A portion of water applied to recharge ponds would be lost to evaporation and an additional portion of the recharged water would be non-recoverable due to retention in the currently unsaturated aquifer materials and lateral migration away from the Project well field. This section provides a preliminary analysis of these issues.

<u>Evaporative Losses</u>

Recharge basins are operated with fairly shallow water levels of only a few feet. The water in these basins heats up and a portion is lost to evaporation. NOAA (1982) estimated the average annual free water body evaporation for the target area to be 85 inches, with 60 inches of this total occurring from May to October (averaging 0.03 feet/day) and the remaining 25 inches of evaporation occurring from November through April (averaging 0.01 feet/day) – which spans the typical recharge season. Assuming that an average of 0.5 feet/day of water is applied to the recharge ponds and that shallow water evaporation is typically 12% higher than the deep water estimates published by NOAA (DWR, 2003), WDS estimates that 2-3% of recharge pond water would be lost to evaporation during the November through April time frame and that 6-7% would be lost during the May through October time frame.

<u>Irrecoverable water bound to the aquifer matrix</u>

During the first year of recharge there is an initial loss of recharged water that is bound to aquifer materials by a surface tension that prevents gravity drainage (commonly known as specific retention). This is typically a first year impact that is not experienced in subsequent years. WDS used the software program Rosetta to estimate specific retention from 24 soil samples collected by Layne. That work indicates that first year specific retention losses may be approximately 5%. This estimate is likely high because there is still likely some interstitial water remaining in the dewatered aquifer matrix (evaporative losses are negligible below the top 10 feet of soils).

Losses due to mound migration

There is typically a lag of 1-3 years between recharge and recovery. Recovery events usually do not recover the entire banked amount (reserving stored water for infrequent, severe droughts). The banked water (or the mound) migrates laterally during these lag times with a portion flowing beyond the reach of project recovery wells. As discussed in a previous section, the Project would have a right to recover a volume equal to the amount that was originally recharged (less evaporative losses and specific retention) – regardless of the fate of the original water. However, in practice, water banks usually enter into monitoring and operating agreements with surrounding pumpers to ensure that the Project only recovers water residing on top of the water table that would have existed absent the Project (or compensate the adjacent pumpers if they are impacted). Therefore, as a practical matter, it can be expected that a portion of the recharged water would migrate beyond the reach of the Project recovery well field and become inaccessible due to contractual controls imposed by monitoring agreements. The amount of this loss is dependent on the following factors:

- The numbers and locations of project recovery wells;
- The numbers and locations of existing irrigation wells that can be used by the Project through in-lieu agreements with their owners;
- The degree of basin overdraft (likely negligible at present);
- The degree to which adjacent pumpers are willing to allow short-term deviations in water levels from the baseline condition in recognition of the long term benefit of the Project.

None of these factors can be estimated at present. However, other Kern County water banks typically lump all evaporative, specific retention and mound migration losses together as a specified percent of recharge water that would not be recovered. The imposed percentages range from 5% to 15%.

In summary, the Project can be expected to lose 7% to 12% of recharged water during the first year due to evaporative and aquifer retention losses. Operationally over time, evaporative and mound migration losses may vary from 5% to 15% per year assuming that adjacent pumper cooperation is similar to that of other Kern County water banks.

Compatibility of Recharge Water and Groundwater

Detailed geochemical analyses would be required to evaluate the long term water quality impacts of recharge. However, the following observations can be made:

- Recharged water would either be from the SWP or from the Owens Valley (LADWP via LAA#2). SWP water has been applied to the target area for 30-years with no apparent degradation in water quality;
- The Lahontan Regional Water Quality Control Board has approved SWP water for recharge; and
- While Owens Valley water in LAA#2 is generally of high quality, it has had a historical average arsenic concentration of 22 ug/l although concentrations have been less than 10 ug/l and commonly less than 5 ug/l since 1996. Arsenic has not been detected in target area groundwater, the USEPA has set a new MCL of 10 ug/l and the California Department of Health Services will promulgate a new state MCL by January 2006. The California arsenic MCL is expected to be less than 10 ug/l.

As indicated above, WDS does not anticipate any water quality problems related to recharge of SWP water. However, WDS believes that careful monitoring of the Owens Valley water would be required to ensure that concentrations in recharge water do not exceed the Federal MCL or the anticipated lower State MCL. Some additional mechanisms for handling this issue are as follows:

- Owens Valley water would be available for recharge in high-flow (wet) years which occur approximately 3-4 times every 10-years. As detailed in the in the 1993 EIR for the review of Mono Basin water rights (Jones & Stokes, 1993), arsenic concentrations in the LAA aqueduct decline to less than 2 ug/l in these high flow years;
- As detailed in a following section, WDS has assumed that the Project would include a new 4-mile pipeline running from LAA#2 through the recharge pond area and to the AVEK West Feeder. This configuration would permit both SWP and Owens Valley water to be received at the same time and mixed in project ponds to dilute arsenic concentrations (SWP water typically does not contain detectable concentrations of arsenic);
- The Project pipeline would enable LAA#2 water to be delivered directly into the West Feeder which serves Rosamond through the 14 mgd (22 cfs) Rosamond water treatment plant. It might be possible for LADWP to enter into an exchange agreement with AVEK to receive the LAA#2 water at the Rosamond plant in-lieu of SWP deliveries (with payments for incremental increased in treatment costs). LADWP has entered into agreements of this type with other water agencies;
- Owens Valley water could potentially be delivered into the California Aqueduct in exchange for delivery of SWP water to the facility through the AVEK West Feeder. However, current DWR policies include a Tier 1 water quality policy that prohibits degradation of California Aqueduct water quality. Therefore a Tier 2 exemption would be required. This issue is currently being evaluated in detail by the Pump-In Facilitation Group – a consortium of SWP contractors and water banking entities that are encountering similar problems with arsenic (and other constituents) in water they wish to deliver into the aqueduct; and
- Owens Valley water could be delivered to Los Angeles, treated (as is currently done) and then delivered to other MWD customers in-lieu of SWP deliveries. An equal volume of MWD SWP entitlement would then be diverted into the East Branch of the California Aqueduct and delivered into the facility through reverse flow in LAA#2 or through the AVEK West Feeder.

Taken together, it appears that a combination monitoring, use of high flows, coordinated dilution and institutional exchanges would likely permit Owens Valley water to be accepted by the Project. This is an issue that is central to several other current projects and represents one of the most acute policy issues facing the SWP at this time. Detailed evaluations are required.

Potential Water Banking Configurations

WDS conservatively estimates that water bank entitlement costs (to be borne by WDS) could range from $3.2 to $7.1 million. For the sake of conservatism in economic evaluations WDS assumed the most flexible and highest capacity facility with an estimated capital cost of $44.1 million. The facility could process up to 100,000 AF/year with recharge costs of $4/AF, recovery costs of $37/AF and carrying costs of $8/AF per year. A present value analysis (assuming a cost of capital of 6% over 30-years) indicates a total cost of $811/AF of annual capacity – which is 40% to 240% lower than comparable projects.

An endless range of water bank configurations are possible for the target area depending on the needs of the lead agency and degree of adjacent pumper participation. For the purposes evaluating economic viability WDS has conservatively chosen to estimate the costs associated with the most flexible, highest capacity (and therefore most expensive) system. In addition, WDS has conservatively assumed that there would be no in-lieu agreements with adjacent pumpers which would reduce capital and operating costs.

Facilities Layout Alternatives

Based on a review of nearby conveyances and water sources, WDS considered the following potential water bank configurations:

Alternative 1, Local Conveyances Only: As indicated on Figure 4, the target parcels are served by two turnouts from the AVEK West Feeder which delivers SWP water to farmers and the Rosamond area at up to 225 cfs (13,388 AF/month). The piping of this turnout would be enlarged and recharge ponds sized to accept up to 13,388 AF/month and sufficient wells would be installed (or contracted with pumpers) to deliver an equivalent flow back to the West Feeder. This alternative could directly serve all AVEK customers on the West Feeder and could serve SWP contractors through exchange (banked water would be delivered to West Feeder customers in-lieu of SWP deliveries, making an equivalent volume available in the East Branch of the California Aqueduct for delivery to others). Taking into account required AVEK deliveries that could not be interrupted, this alternative would likely use less than 50% of the target area water banking capacity, but would likely be the least expensive alternative. The layout could be supplemented by in-lieu connections to surrounding pumpers.

Alternative 2, Regional Conveyances Only: As indicated on Figure 2, the target parcels are immediately adjacent to LAA#2 which delivers Owens Valley water to Los Angeles at up to 290 cfs (17,256 AF/month). A new turnout would be constructed from LAA#2, recharge ponds would be sized to accept up to 17,256 AF/month and sufficient wells would be installed (or contracted with pumpers) to deliver an equivalent flow back to LAA#2. LA DWP indicates that LAA#2 operates under an average pressure of 52 psi in the area of the target parcels, requiring addition of a booster station to deliver recovered water back into LAA#2. There is currently not an interconnection between LAA#2 and the East Branch of the California Aqueduct (although there is a concrete vault ready for installation of the interconnection). Under this scenario that interconnection would be installed to permit recovered water to be delivered either to Los Angeles or into the California Aqueduct. LADWP has significant operational flexibility with LAA#2 because they are able to divert flows into LAA#1. Therefore, the LAA#2-California Aqueduct interconnection would also be equipped with a

low-head, high flow lift station to permit diversion of SWP water into LAA#2 for delivery to the recharge facility (by reversing flow in LAA #2). This alternative could directly serve Los Angeles and SWP contractors. Taking into account required LADWP deliveries, this alternative would likely use less than 70% of the target area water banking capacity. The layout could be supplemented by in-lieu connections to surrounding pumpers.

Alternative 3, Local and Regional Conveyances (Evaluated Alternative): Alternative 3 would combine all elements of the previous 2 alternatives to provide the most flexible, highest capacity and highest cost operation. As previously noted, less expensive alternatives are likely, but this, most expensive alternative was chosen for the purposes of evaluating economic viability (if this alternative is economically viable, all other alternatives would be even more viable). Figure 19 and 20 depict the assumed layout. Assuming a capacity of 100,000 AF/year, a 5-month recharge season and a 7-month recovery season, the facility would require 336 cfs of conveyance capacity for recharge (65% of the combined capacity of LAA#2 and the West Feeder) and 240 cfs of conveyance capacity for recovery (47% of the combined capacity of LAA#2 and the West Feeder). The following sections provide preliminary cost estimates for this alternative.

Alternative 3 Preliminary Cost Estimates

Tables 19 through 22 present key assumptions, preliminary capital cost (CAPEX), permitting cost and operating cost (OPEX) estimates for Alternative 3. As detailed on Table 20, WDS conservatively estimates that project facilities would require a CAPEX of $44.1 million. This estimate does not include permitting costs or land acquisition because, as currently contemplated, these costs would be incurred by WDS. Table 21 presents the permitting costs that WDS is expected to incur – totalling anywhere from $3.3 to $7.1 million (mid-range of $4.9 million). While lower permitting costs might be possible, given the current concerns, law-suits and adjudication proceedings, WDS believes that the presented numbers are conservatively realistic.

Table 19: Key CAPEX and OPEX Assumptions

Assumption	Notes
20% contingency	Applied to all CAPEX components
336 cfs recharge capacity	Based on a typical 5-month recharge season
240 cfs recovery capacity	Based on a typical 7-month recovery season.
Cut and fill of 380,000 cubic yards to create 1,467 acres of active recharge ponds on 1,467 total acres (90%) with earthen distribution canals and internal berms to control sedimentation.	Includes pipeline outlet structures, soil management areas, routing berms to provide 80-acre sub-basins, distribution canal turnout structures, perimeter fencing, reseeding, and 15% soil moving "fluff" factor. This is conservatively based on an average recharge rate of 0.5 feet/day. WDS investigations indicate that only 1,147 acres would be required. Psomas (1998) estimated that 1,100 acres would be required.
54 acres of right-of-way obtained from adjacent land owners with 218 acres of temporary construction easements	The off-site acreage would be required for downgradient recovery wells. If existing wells are used through cooperative agreements, this acreage would be reduced. The Project has been designed to place major sub-surface piping in county road right-of-ways.
A new interconnection between LAA#2 and California Aqueduct	This interconnection would enable water to be lifted from the California Aqueduct and sent down LAA#2 to the recharge facility. Conversely the interconnection would permit recovered water to be discharged into the California Aqueduct. The concrete vault for this interconnection already exists and a lift station would only be required to prime a siphon. This is because once water has been lifted out of the California Aqueduct there is a 230-foot topographic drop from the aqueduct down to the target parcels

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Assumption	Notes
	along the route of LAA #2 (with estimated frictional head losses of less than 70 feet).
A new turnout from LAA#2 to the Project including a return flow booster pump	This turnout would enable water to be gravity fed from LAA#2 into the recharge system. In fact, with an average 52 psi of head, the turnout would require significant pressure regulation. Likewise, the turnout would be used to return recovered water to LAA#2, requiring a booster pump to supplement heads from individual wells.
A new lift pump on Turnout 20A from the West Feeder	This component would be an enlargement of an existing turnout with a lift pump to enable delivery of SWP water to the uppermost recharge ponds. Likewise, the turnout would enable return for recovered water into the West Feeder.
4-mile, 84 inch diameter, buried reinforced concrete pipeline.	Includes road crossings, pressure relief structures, air vents, pipeline connections,
21-miles of 14 to 38 inch diameter buried PVC and steel piping from wells to conveyances	
Well specific capacity of 27 gpm/ft	Based on measurements from 11 nearby irrigation wells. This assumption is highly conservative for the following reasons: • The average of most wells in the target area was 39 gpm/ft, but 4 outliers (likely due to poor well conditions) were included anyway; • The USGS indicates an average of 50 gpm/ft for the target area (assuming properly installed wells); and • WDS has budgeted for installation of high efficiency wells that would have significantly higher specific capacities than existing irrigation wells.
Installation of 34 new wells and use of 5 existing wells	This assumption is conservative for the following reasons: • See notes on specific capacity above; and • There are more than 37 existing wells in the target area that might be used.
Use of high efficiency, wire wrapped screen in wells	This assumption is highly conservative, given the coarse grained nature of the aquifer, this expense is likely not warranted, increasing well costs by 20% to 30%.
Well costs ranging from $450,000 to $550,000 per well	This cost includes installation, pump, electric motor, gears, power drop, piping to manifold, development, housing, controls and contingency. It would likely be more cost effective to run the wells on diesel or propane given their infrequent use. A present value analysis should be performed.
Flow, water level, pressure and on/off telemetry installed on all wells and pump stations	This is conservative. In practice most projects only install telemetry on pump stations.
Construction of a new maintenance and project support building.	This may be conservative depending on existing facilities of the lead agency
Pond sediment cleanout approximately every 3-years	This work would be performed to ensure that desired recharge rates are maintained.
OPEX includes higher maintenance costs as facilities age	This calculation ensures that facilities are slowly replaced over time.
Hiring of 6 employees to manage the Project	Assumed staffing includes a project manager, 2 operators, 1 administrative assistant and 2 laborers.
$0.06/kW-hr power tariff	This is the assumed rate for a public agency.
15% engineering, administration and legal as a percentage of CAPEX	This is conservative. Most recent water banking projects have averaged 10%.

Table 20: Preliminary CAPEX Estimate

Item	Estimate (including 20% contingency)
Easements and right-of-way	$1,239,340
Detailed engineering design and construction oversight	$4,763,621
Conveyances[1]	$19,342,845
Recharge ponds[2]	$1,064,146
Well field[3]	$16,006,136
O&M infrastructure and telemetry	$1,695,840
CAPEX (not including land or permitting)	**$44,111,928**

1) Includes LAA#2-California Aqueduct interconnection, new turnout from LAA#2 with booster station, enlarged West Feeder turnout with lift station, connections to well piping/connections and 4-mile pipeline
2) Includes earthwork, reseeding and fencing
3) Includes installation, pump, electric motor, gears, power drop, piping to manifold, development, housing and controls

Table 21: Anticipated Permitting Costs (to be incurred by WDS)

Item	Low	Mid	High
Public Relations, Political Lobbying	$50,000	$75,000	$100,000
Creation of legal documents	$250,000	$375,000	$500,000
On-going water level monitoring	$50,000	$75,000	$100,000
Land surveys, mapping for env. & eng. purposes	$100,000	$150,000	$200,000
Preliminary engineering - recharge pond construction	$100,000	$150,000	$200,000
Hydrogeologic investigations	$400,000	$525,000	$650,000
Modeling of groundwater characteristics	$150,000	$225,000	$300,000
Biological surveys for environmental compliance	$50,000	$75,000	$100,000
EIR, permitting, general and administrative	$1,582,000	$2,445,000	$3,800,000
TOTAL	**$2,732,000**	**$4,095,000**	**$5,950,000**
Total with 20% contingency	**$3,278,400**	**$4,914,000**	**$7,140,000**

Table 22: Preliminary OPEX Estimate at Full Capacity

Item/Year	1	2	3	4	5	6
Recharge (AF)	100,000	100,000	100,000	100,000	100,000	100,000
Recovery (AF)	0	28,485	100,000	100,000	100,000	100,000
Put electrical costs ($)	0	0	0	0	0	0
Take electrical costs ($)	0	926,694	3,253,276	3,253,276	3,253,276	3,253,276
Labor ($)	297,490	372,040	372,040	372,040	372,040	372,040
Chemicals ($)	0	0	0	0	0	0
Fuel ($)	2,600	2,600	2,600	2,600	2,600	2,600
Analytical ($)	17,600	17,600	17,600	17,600	17,600	17,600
Consulting ($)	40,000	40,000	40,000	40,000	20,000	20,000
Basin sediment cleanout ($)	0	0	113,321	0	0	113,321
Maintenance/repair of conveyance assets ($)	48,357	67,700	94,780	132,692	185,769	260,076
Maintenance/repair of recharge basins ($)	2,660	3,725	5,214	7,300	10,220	14,308
Maintenance/repair of wells ($)	0	40,015	56,021	78,430	109,802	153,723
Maintenance/repair of O&M infrastructure ($)	4,240	5,935	8,310	11,633	16,287	22,802
G&A (including replacement of tools, computers etc, $)	109,800	109,800	109,800	109,800	109,800	109,800
Miscellaneous fees ($)	60,000	60,000	60,000	60,000	60,000	60,000
Total OPEX ($)	**582,747**	**1,646,109**	**4,132,962**	**4,085,372**	**4,157,394**	**4,399,546**
Fixed costs ($)	582,747	719,415	766,365	832,095	904,118	1,032,949

Does not include depreciation, taxes or debt service

Alternative 3 Comparables Analysis

In preceding sections WDS has concluded that the Project is technically feasible. This section evaluates feasibility from an economic perspective by comparing estimated project costs to those that have been or would be incurred by comparable projects. Table 23, Figure 21 and Figure 22 summarize this analysis.

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Table 23: Economic Comparison to Other Storage Projects

Project	CAPEX and Land Acquisition ($)	Total Storage (AF)	Capacity (AF/yr)	CAPEX Per AF of Annual Capacity ($/AF)	Put OPEX ($/AF)	Take OPEX ($/AF)	Inactive OPEX ($/AF)	PV ($/AF)
Antelope Valley	**$58,829,333**	**500,000**	**100,000**	**$588**	**$4**	**$37**	**$8**	**$811**
Chino Basin - MWD	$28,200,000	100,000	33,000	$855	$20	$50	$2	$1,185
Semitropic New Unit	$150,000,000	450,000	150,000	$1,000	$25	$25	$2	$1,239
Cawelo proposed to Castaic Lake WA	$15,000,000	120,000	20,000	$750	$0	$200	$0	$1,668
Fresno ID Walden Pond for City of Fresno (marketable capacity)	$12,230,144	NA	8,100	$1,510	$4	$41	$2	$1,726
MID: Phase 1 (marketable)	$63,980,618	117,000	39,000	$1,641	$4	$41	$2	$1,856
Semitropic Existing Unit (firm capacities cited)	$135,000,000	1,000,000	90,000	$1,500	$44	$44	$2	$1,917
Kern Delta - MWD		250,000	50,000	NA	$145	$185	$105	$1,996
Friant: Alternate cost of water purchases absent storage	NA	NA	NA	NA	NA	NA	NA	$2,320
West Coast and Central Basin Pumping Rights	$58,583,350	16,643	16,643	$3,520	$0	$25	$0	$3,635
Terminus Dam	$37,000,000		8,000	$4,625	$0	$0	$0	$4,625
Kaweah Delta	$1,201,336	246	246	$4,883	$0	$0	$0	$4,883
Fine Gold Creek Offstream Storage	$503,000,000		42,000	$11,976	$0	$0	$0	$11,976

Notes

1. Assumes no grants
2. Assumes a 6% cost of capital over 30-years for debt service
3. Does not include permitting (to ensure a valid comparison)
4. Values in red are not known and were assumed low or zero to ensure that the comparison is conservative
5. Assumes recharge 33% of the years, recovery 33% of the years and inactive 33% of the years

The comparison presented above incorporates conservative WDS estimates of land acquisition ($9,000/acre – more than 4 times the current agricultural value) to ensure that the comparables analysis is conservatively valid. Permitting costs were not included because other projects have not reported this expenditure. Some of the required inputs were not available for some of the cited projects. In these instances (indicated in red), WDS conservatively chose values at or near zero. As indicated in the table and figures, this project would be highly cost effective with an estimated present value cost that is lower than all comparable projects. Based on this finding, WDS has concluded that the Project is economically feasible.

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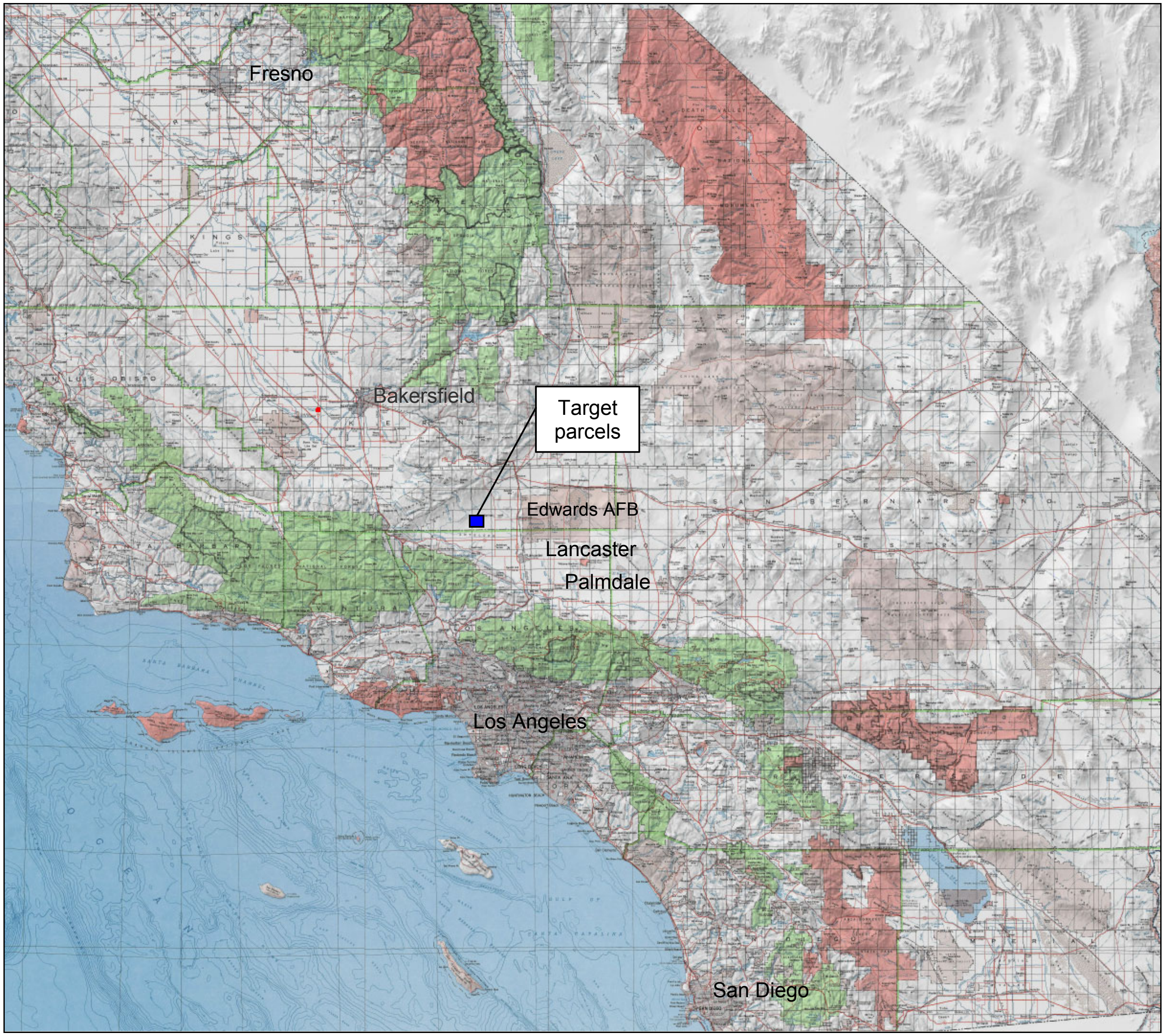


Figure 1: Regional Location Map

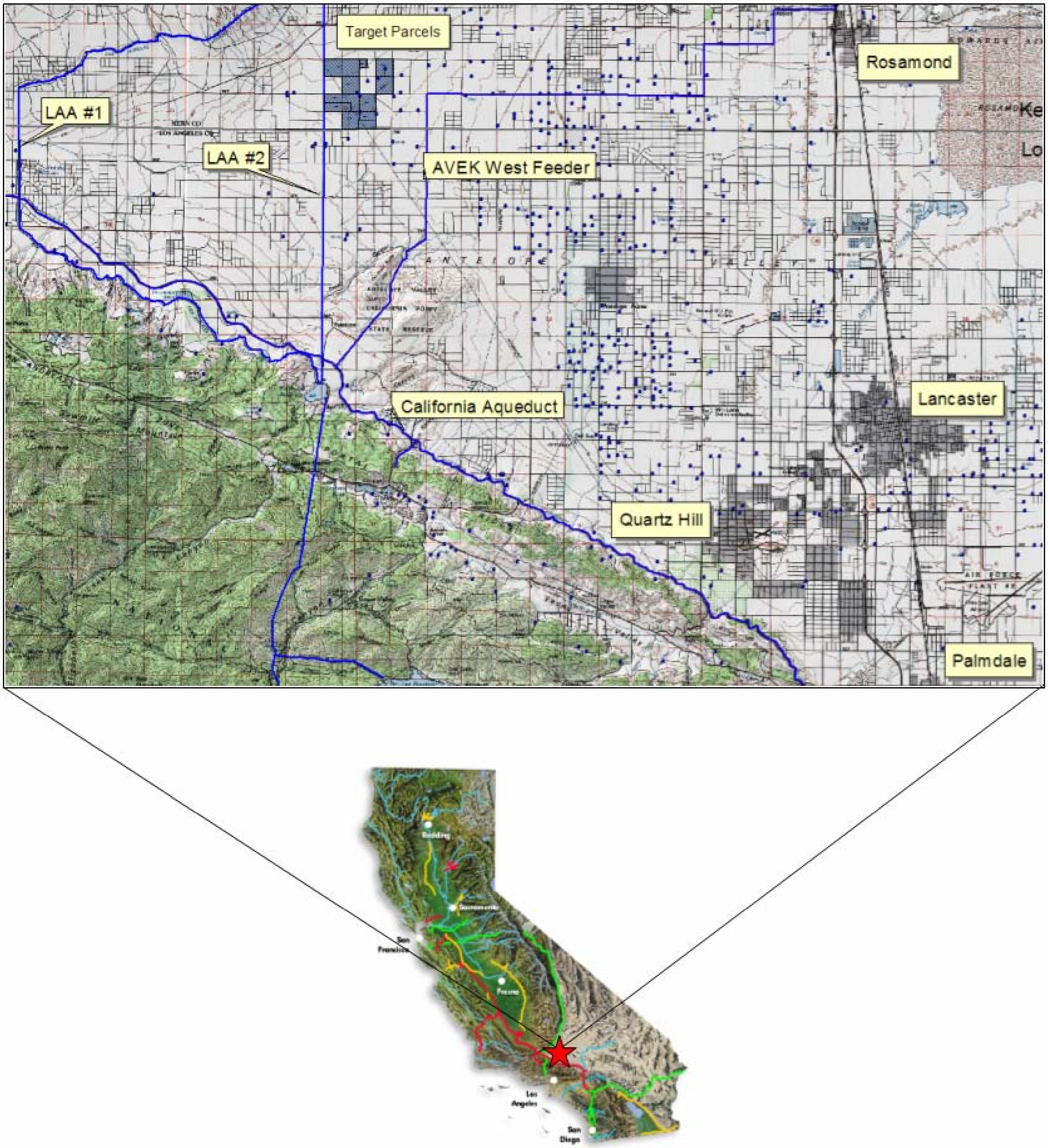


Figure 2: Target Parcel Location Map

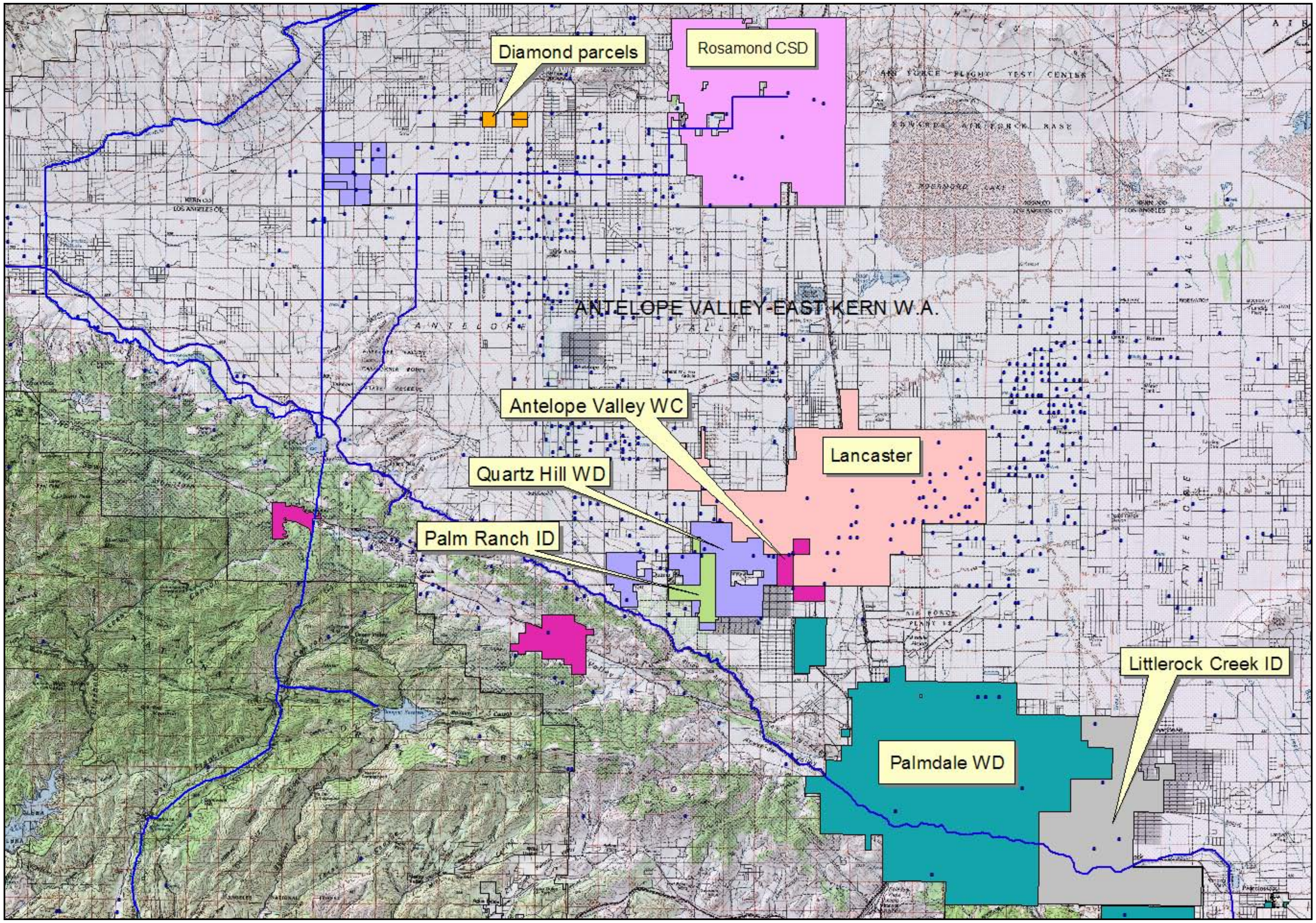


Figure 3: Regulatory Jurisdictions

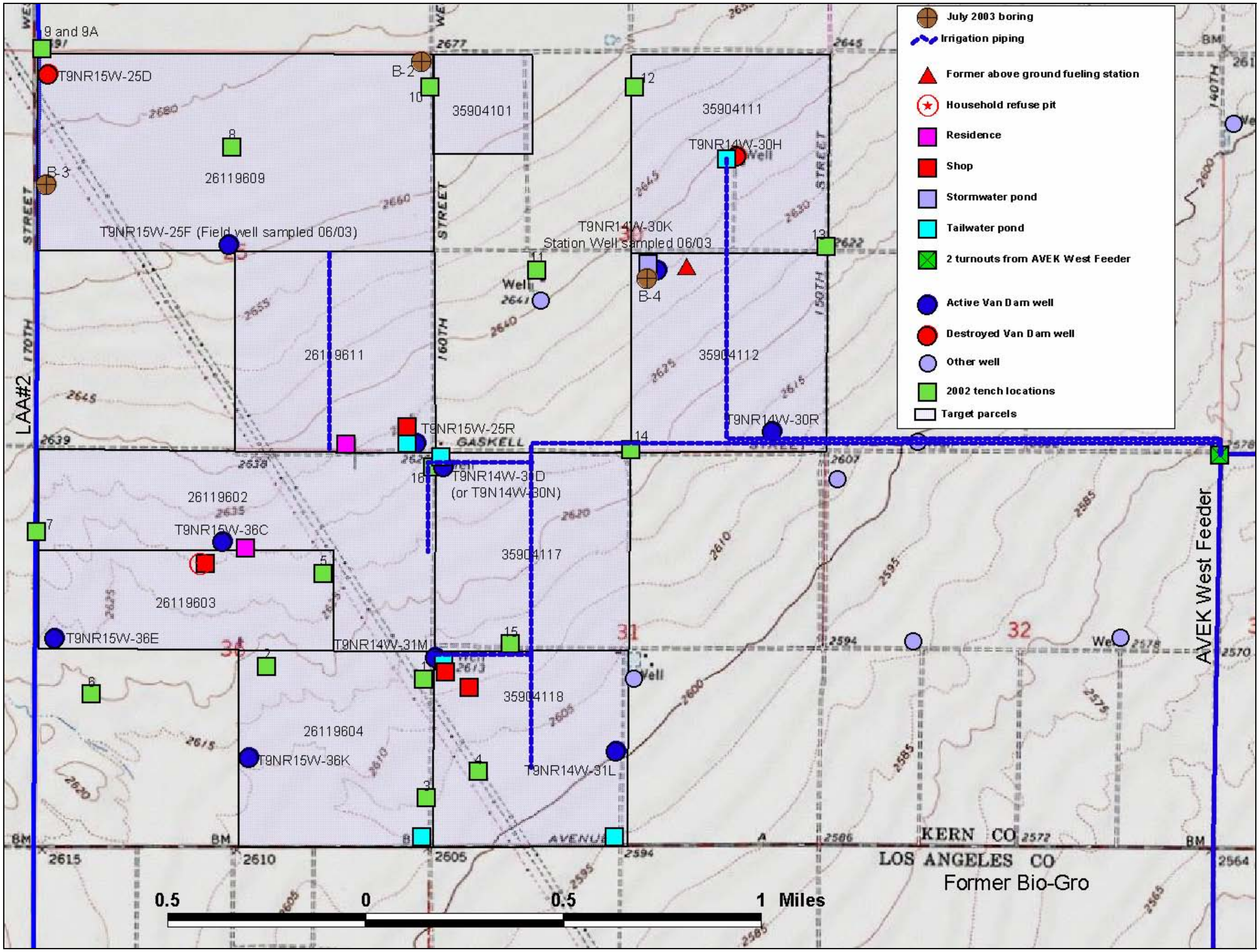


Figure 4: Target Parcel Features

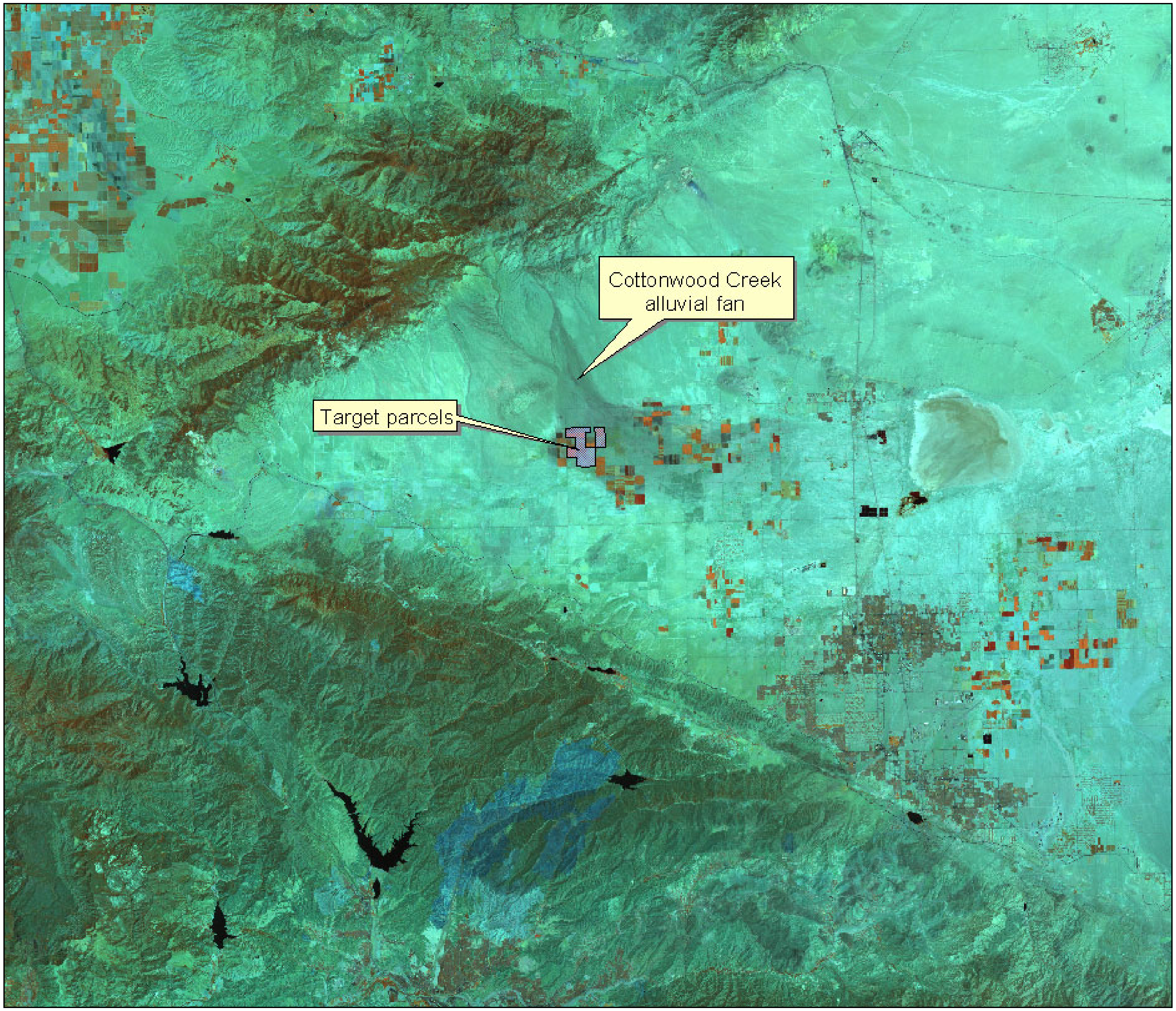


Figure 5: July 26, 2002 Landsat 7 Image (Bands 4,5,7)

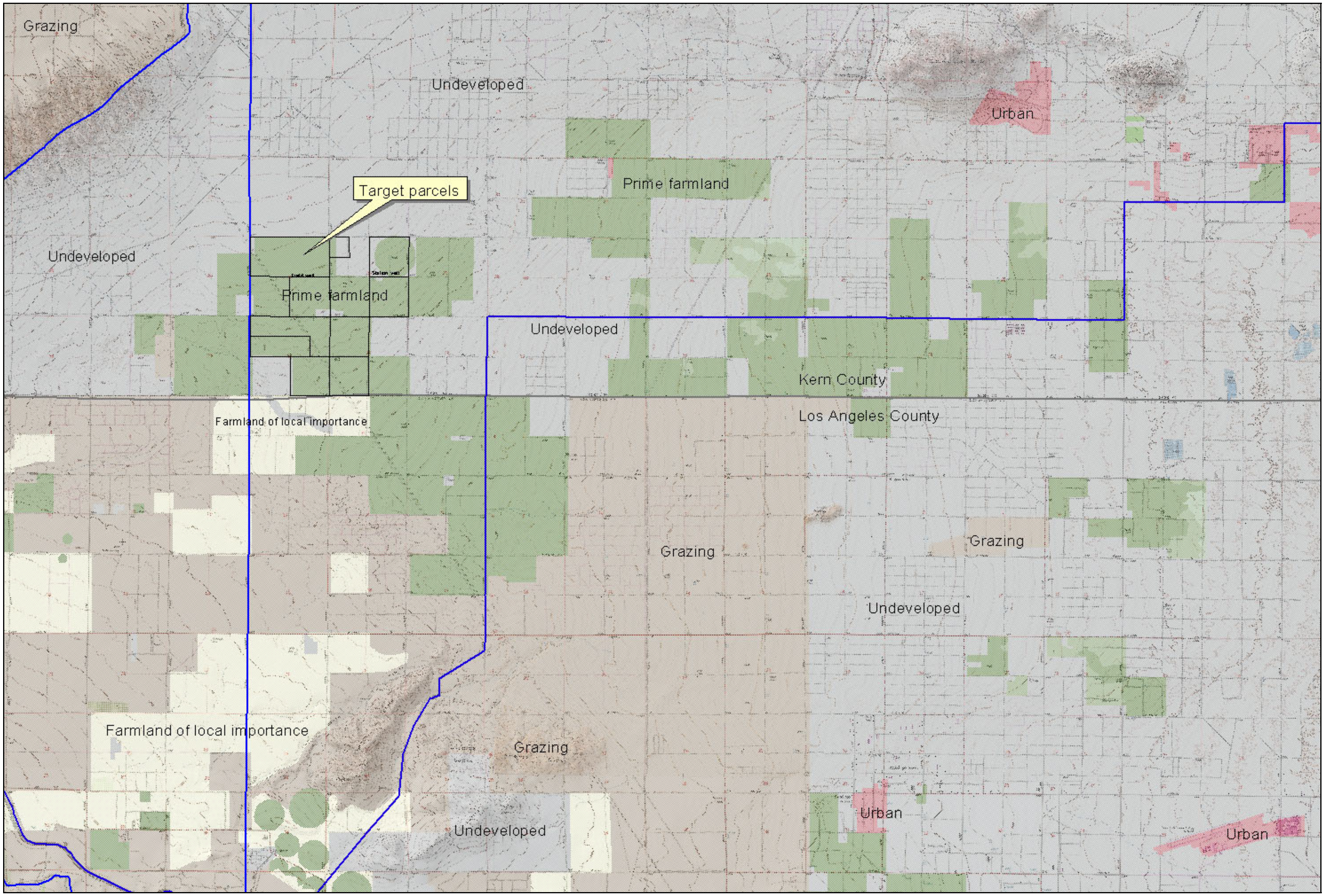
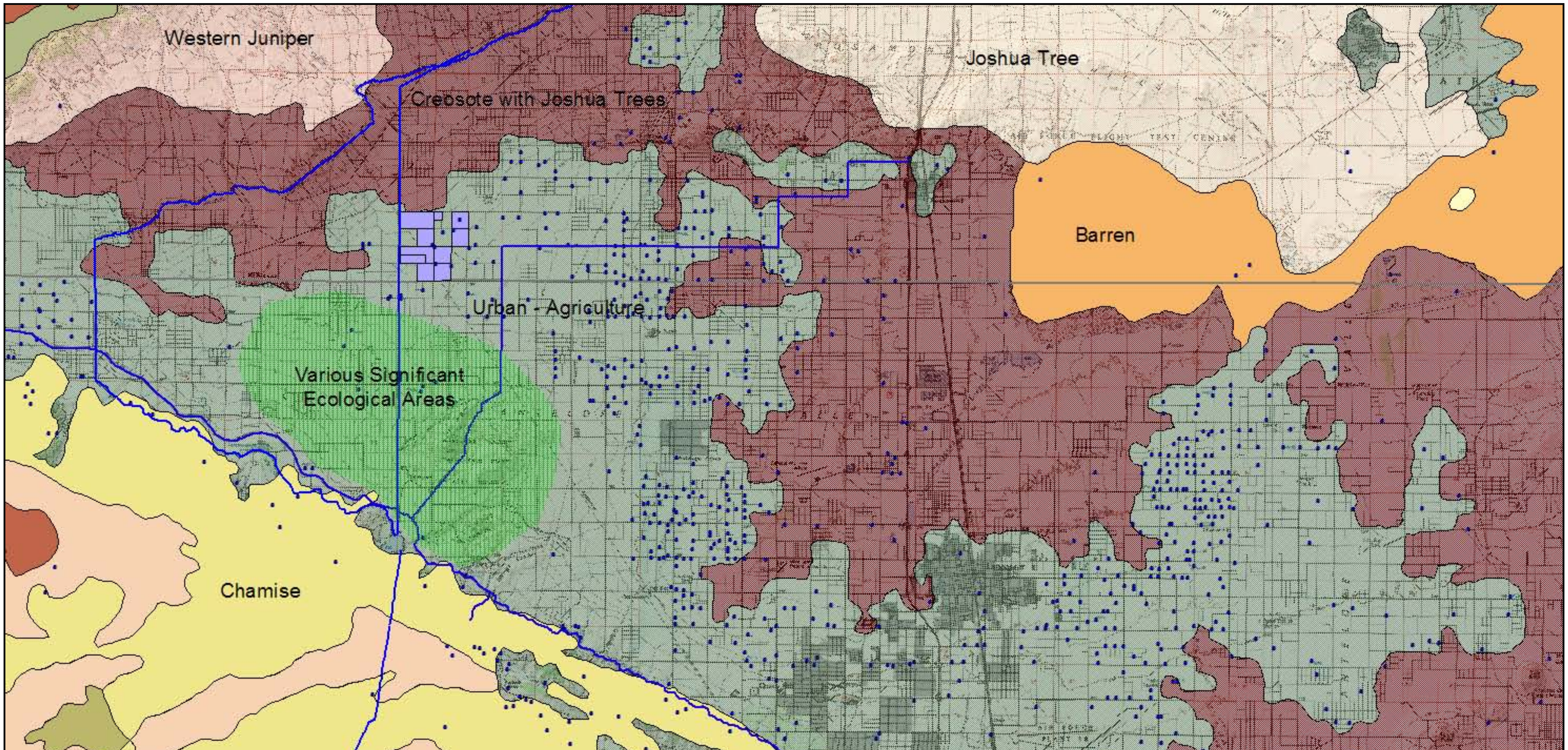


Figure 6: 2002 Land Use



No Federal of California endangered or threatened species identified in target area by CNDD
The nearest endangered species identified was the Spineflower, located south and uphill at least 7 miles
The nearest threatened species was the Swainsons Hawk located at least 1 mile to the east.
Kern Water Bank has been found to enhance the hawk's habitat

Figure 7: Vegetation and Habitat

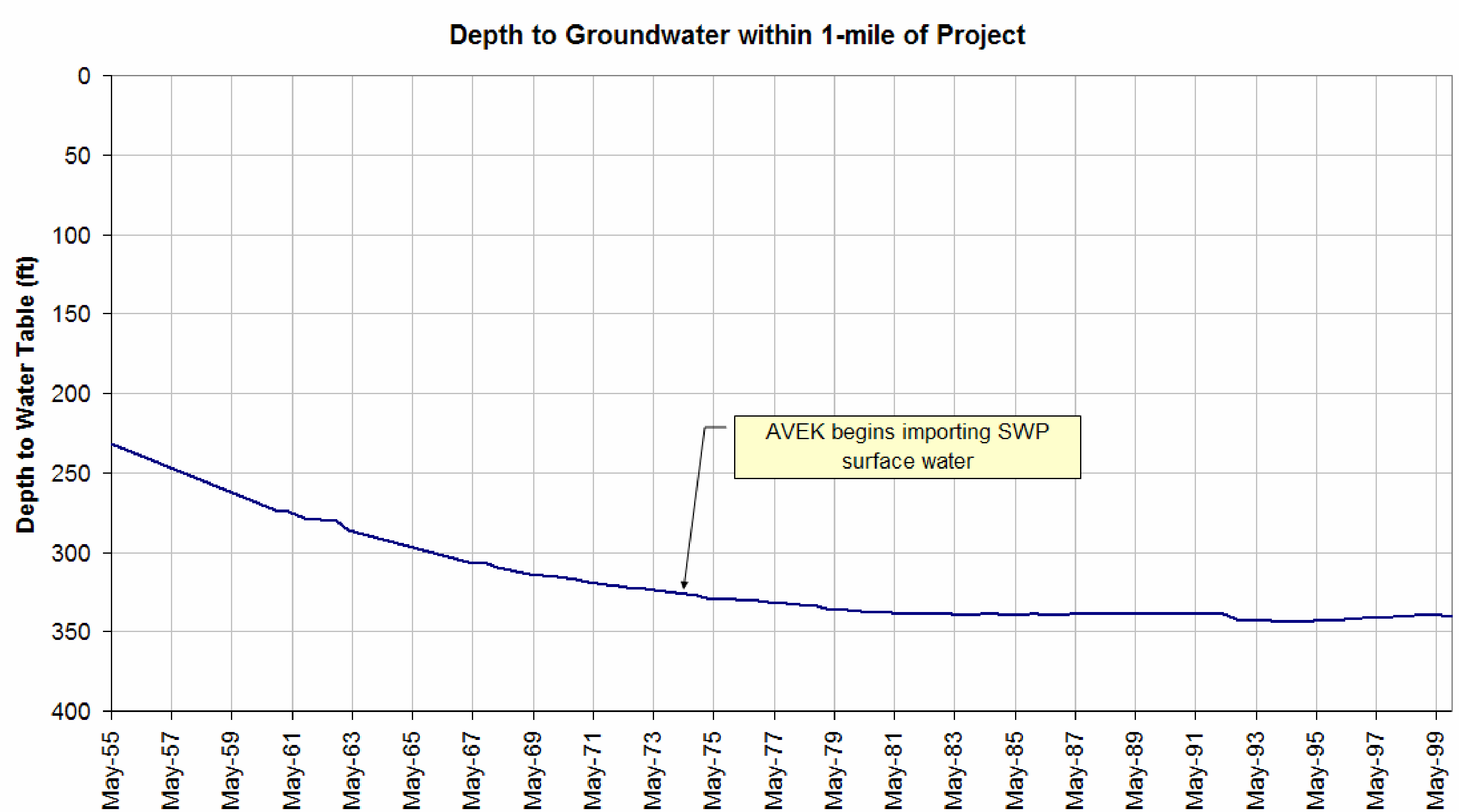


Figure 8: Water levels in a representative well

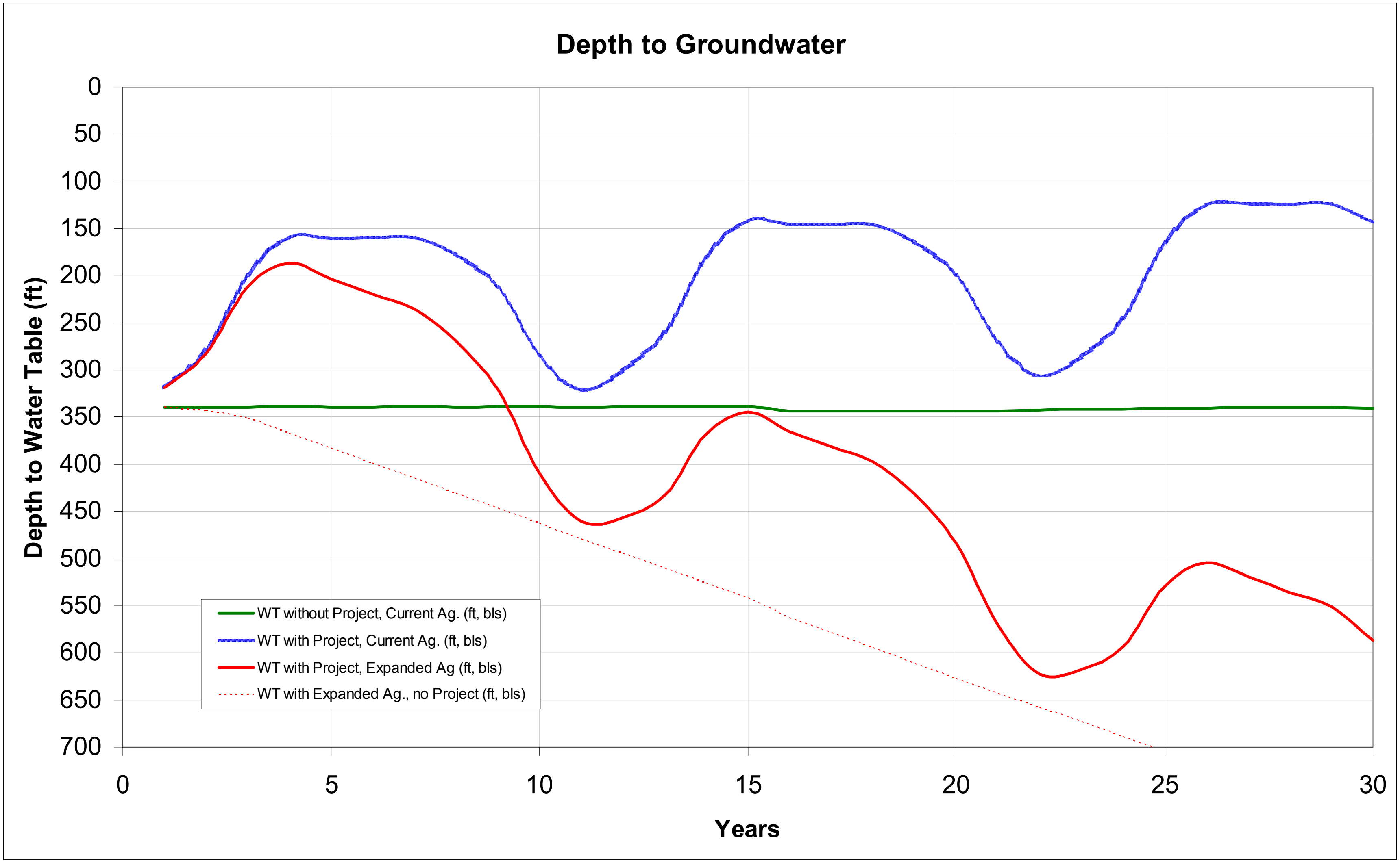


Figure 9: Illustrative Example of Water Bank Impact on Groundwater Levels

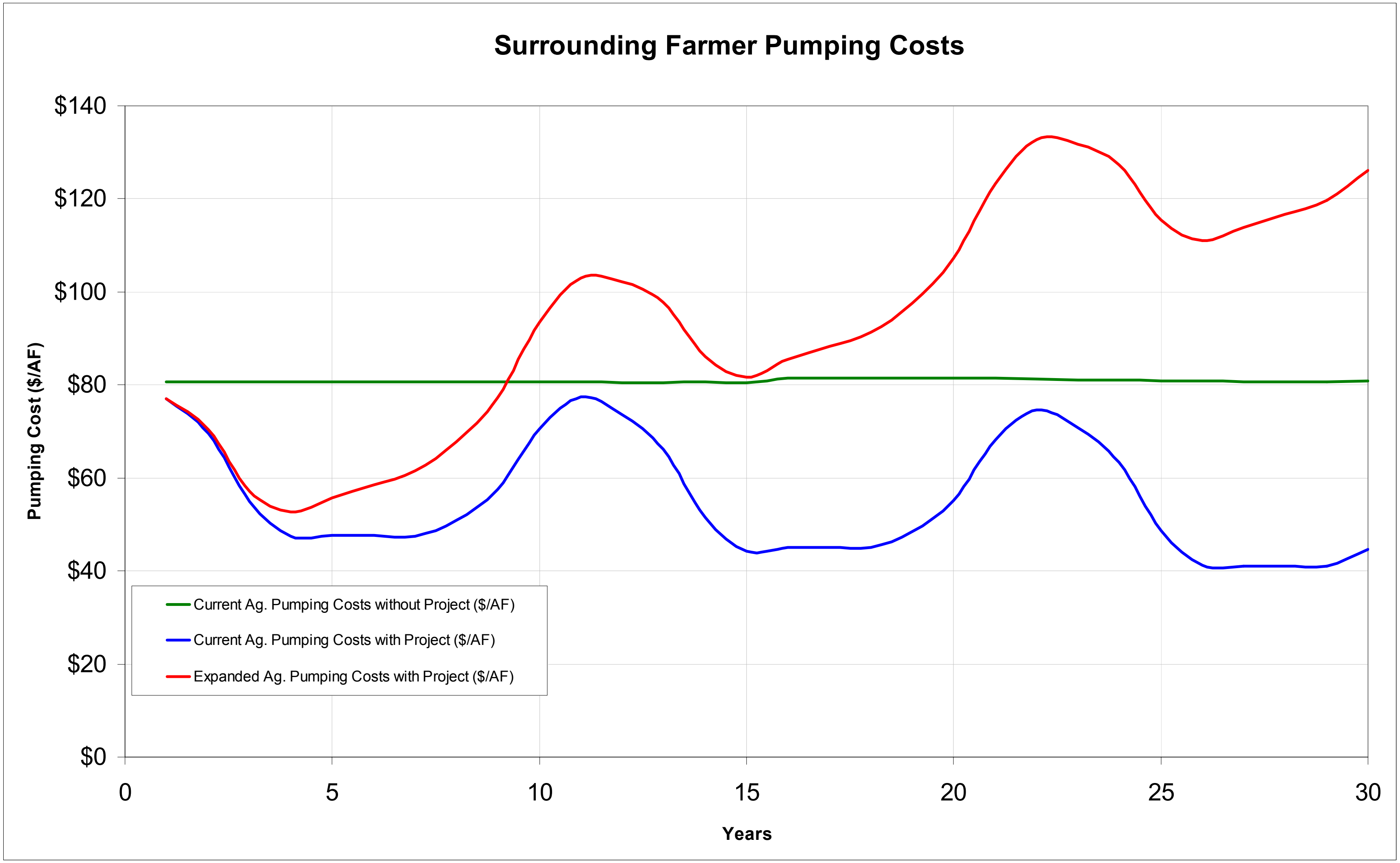


Figure 10: Illustrative Example of Water Bank Impact on Pumping Costs

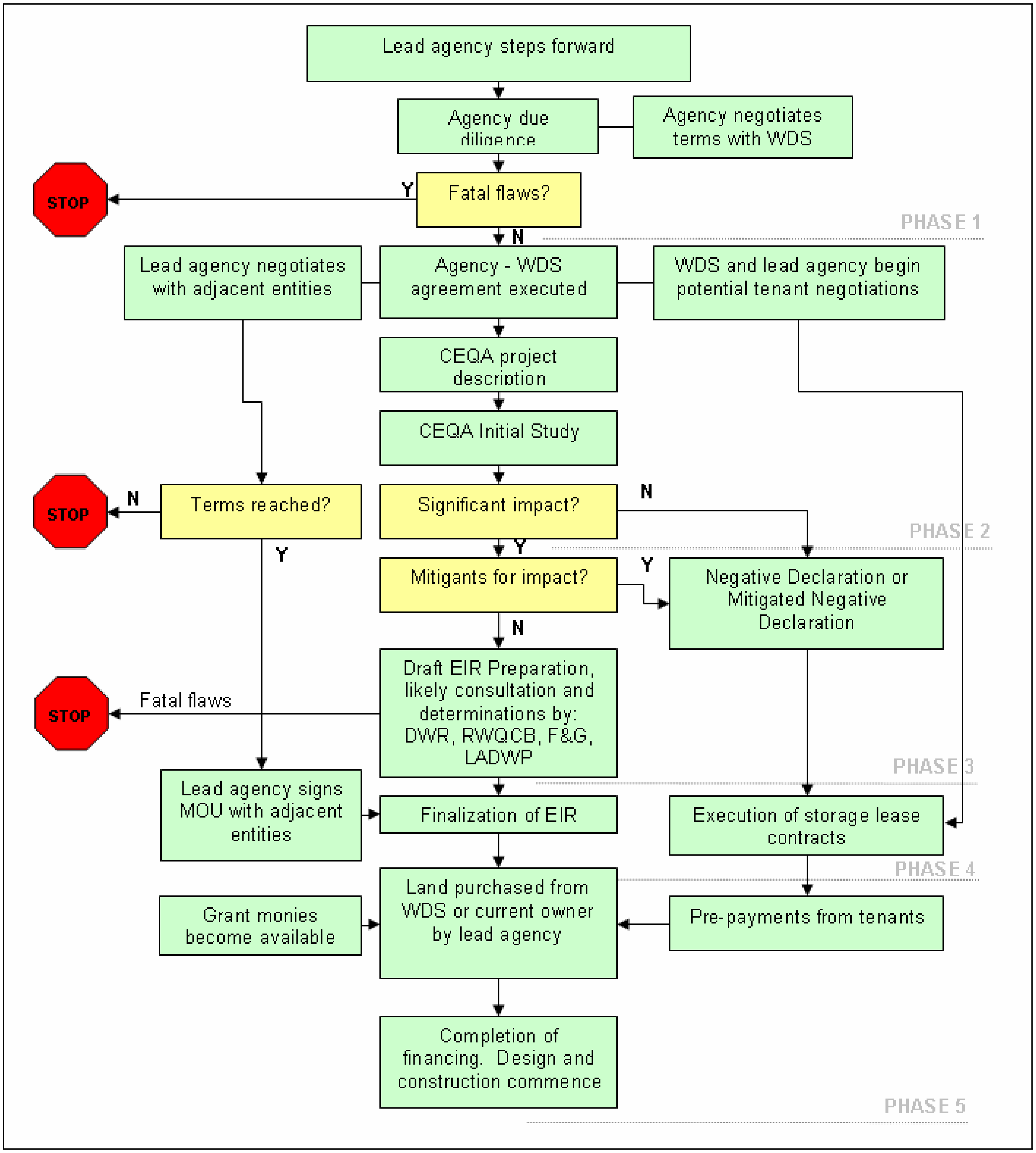


Figure 11: Water Bank Entitlement Critical Path

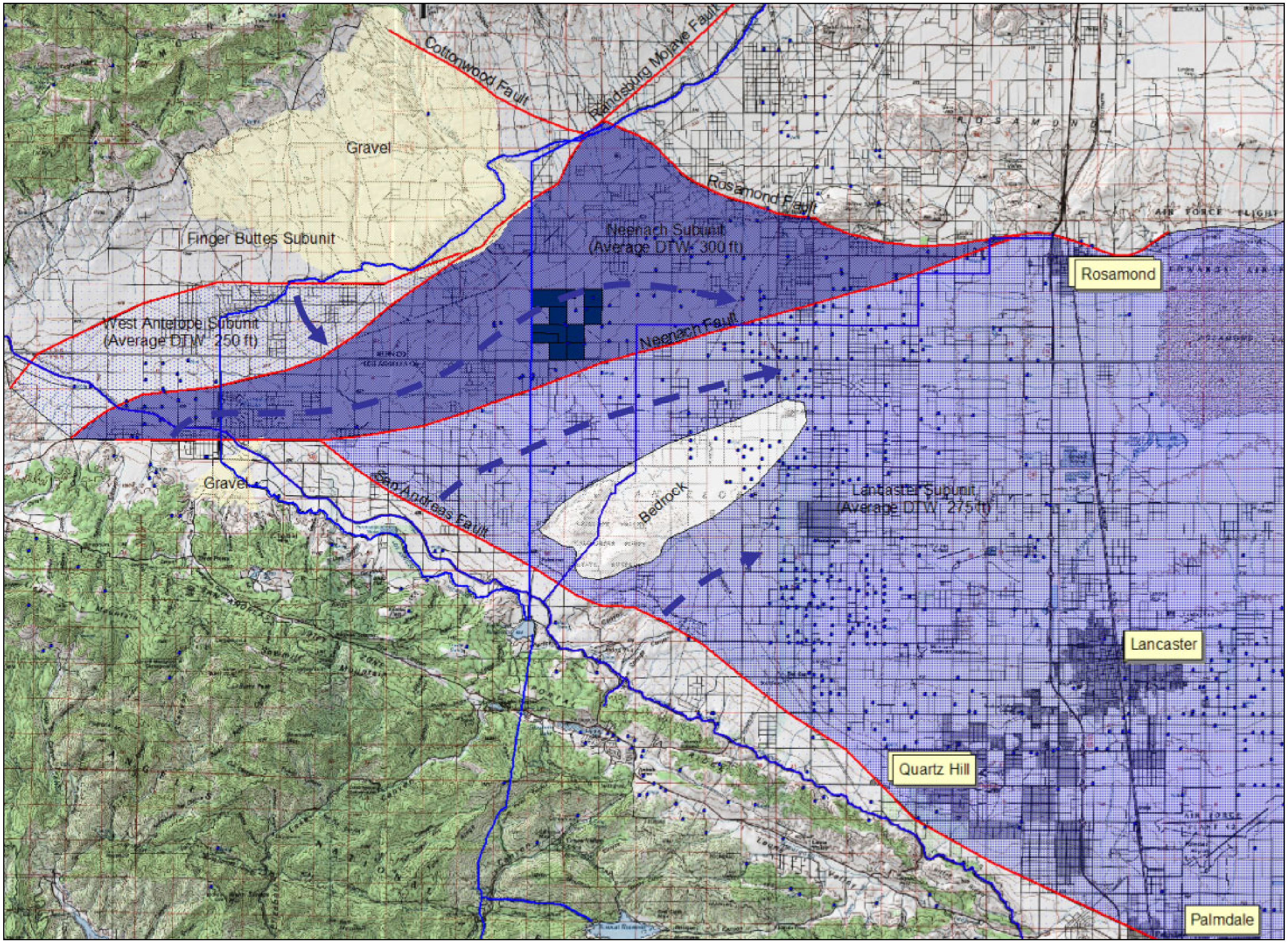


Figure 12: Hydrogeologic Map

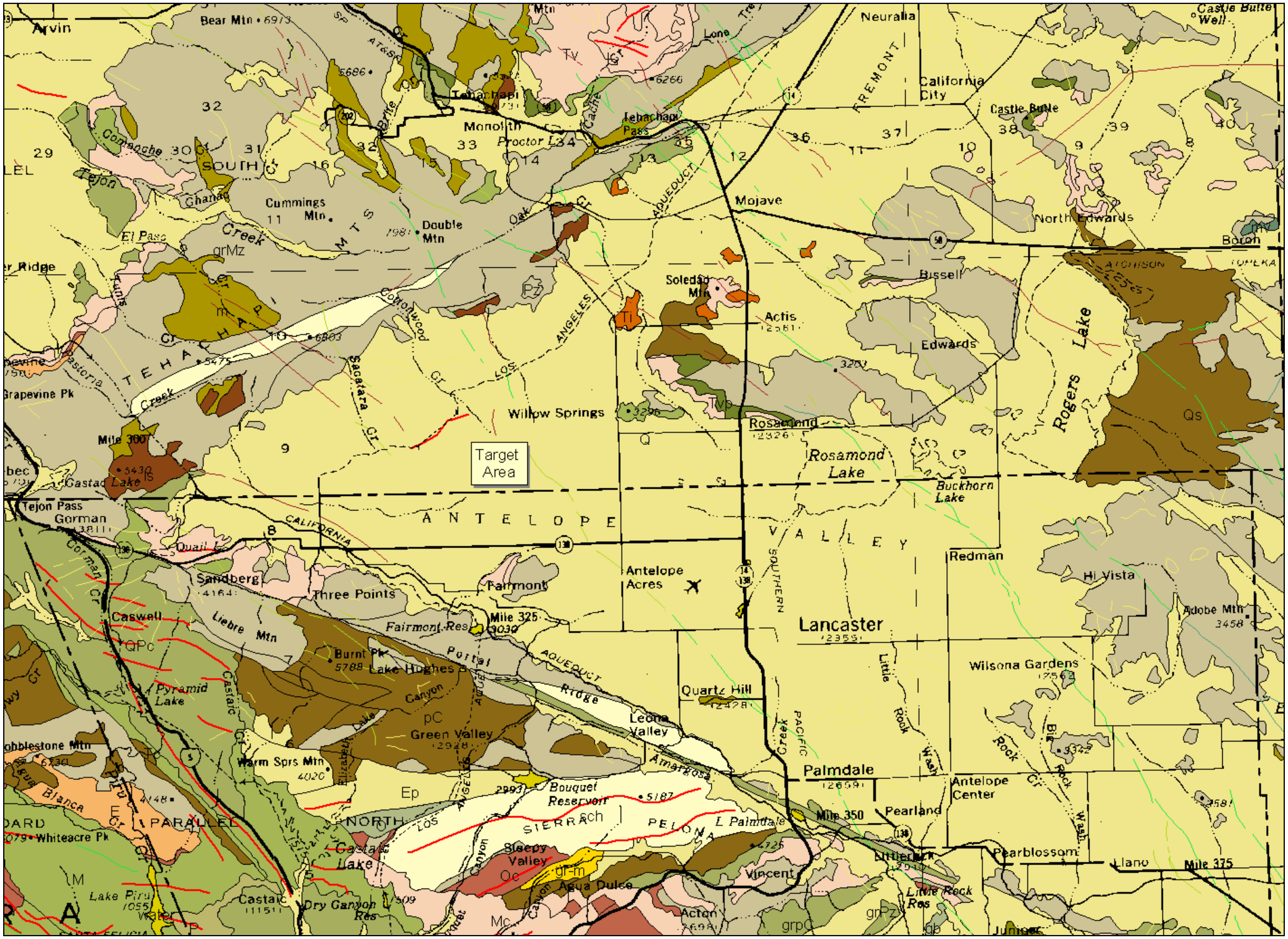


Figure 13: Geologic Map

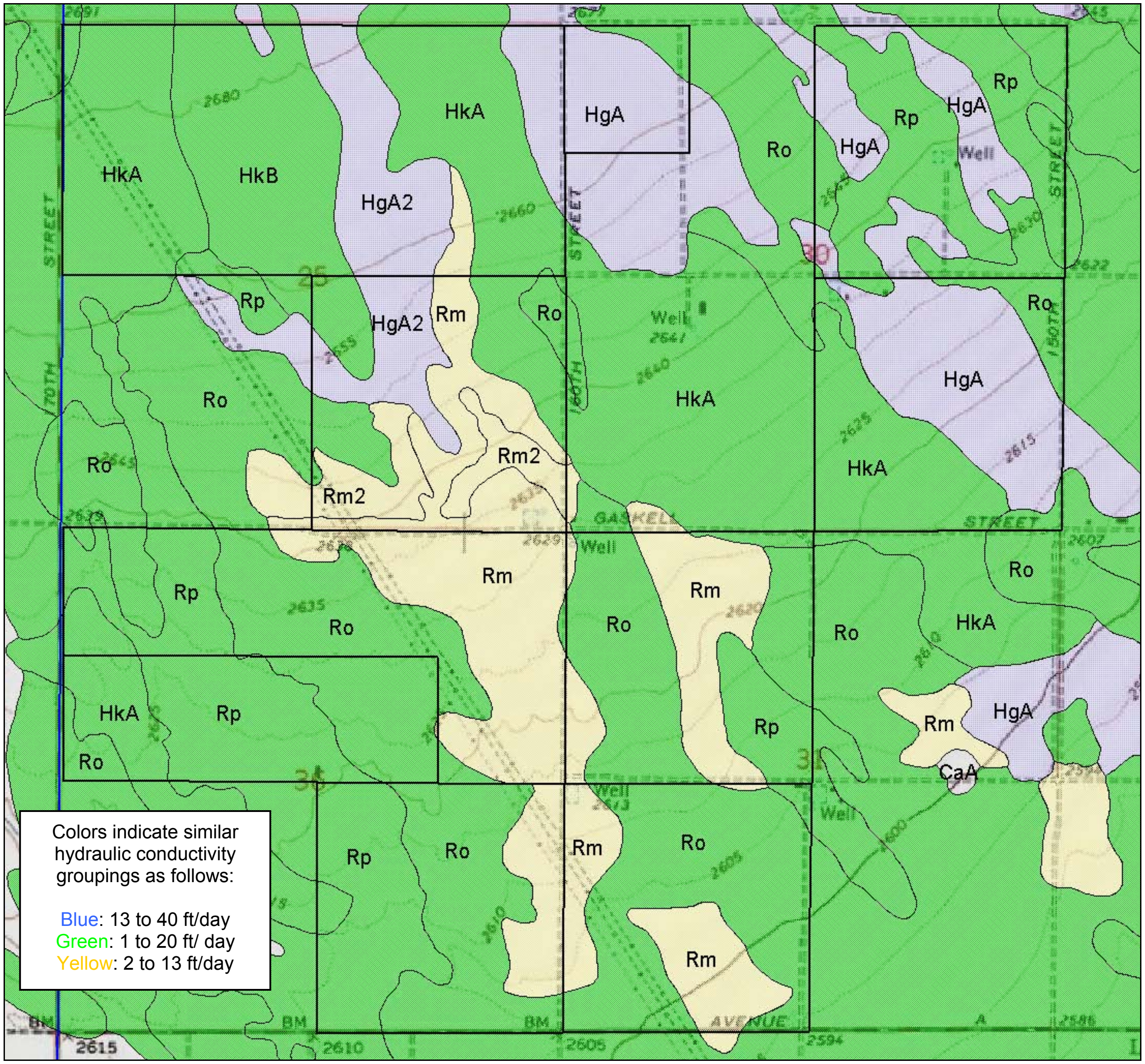


Figure 14: Target Parcel Soil Types

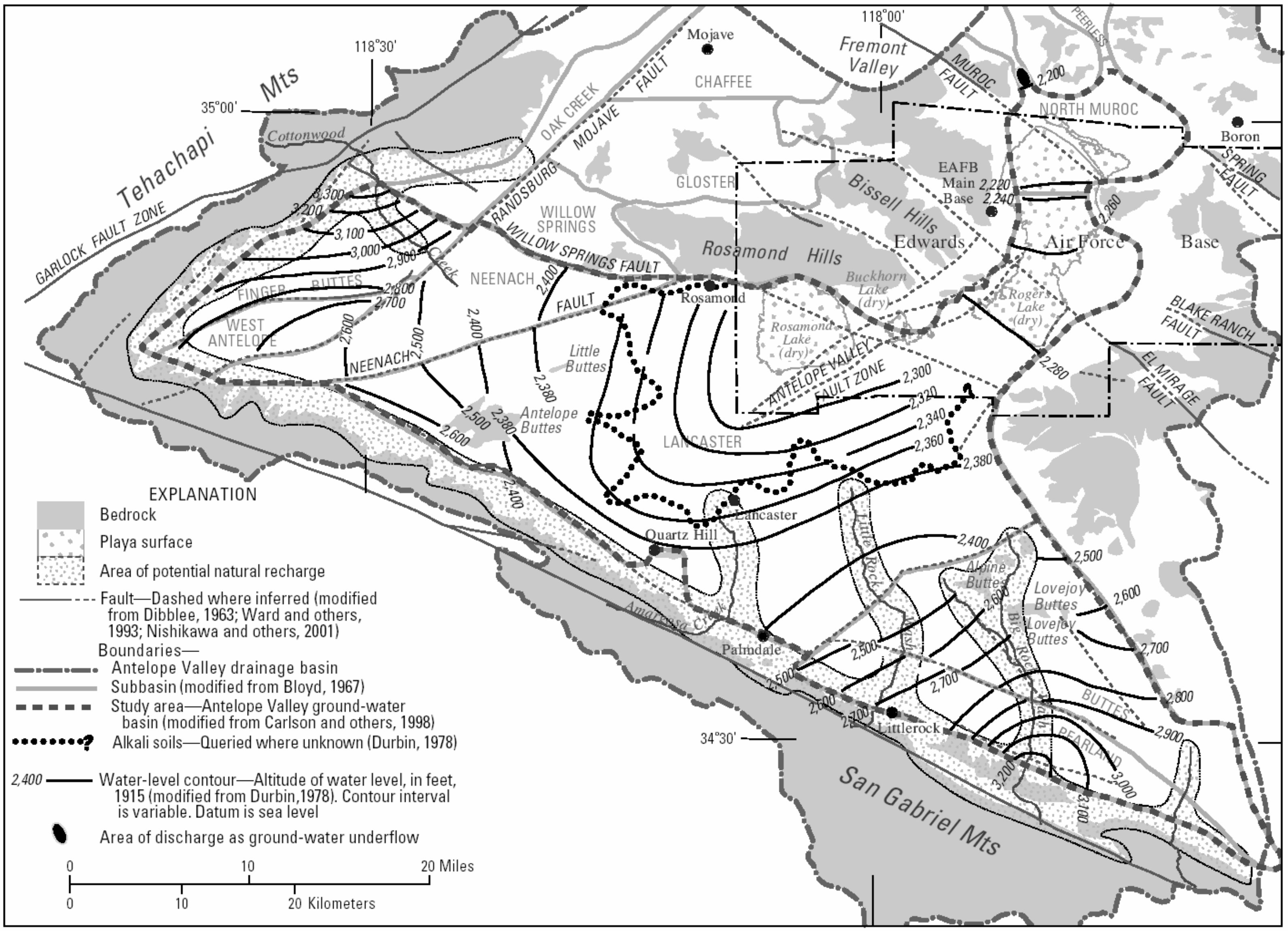


Figure 15: 1915 Water Table Contours (USGS 2003)

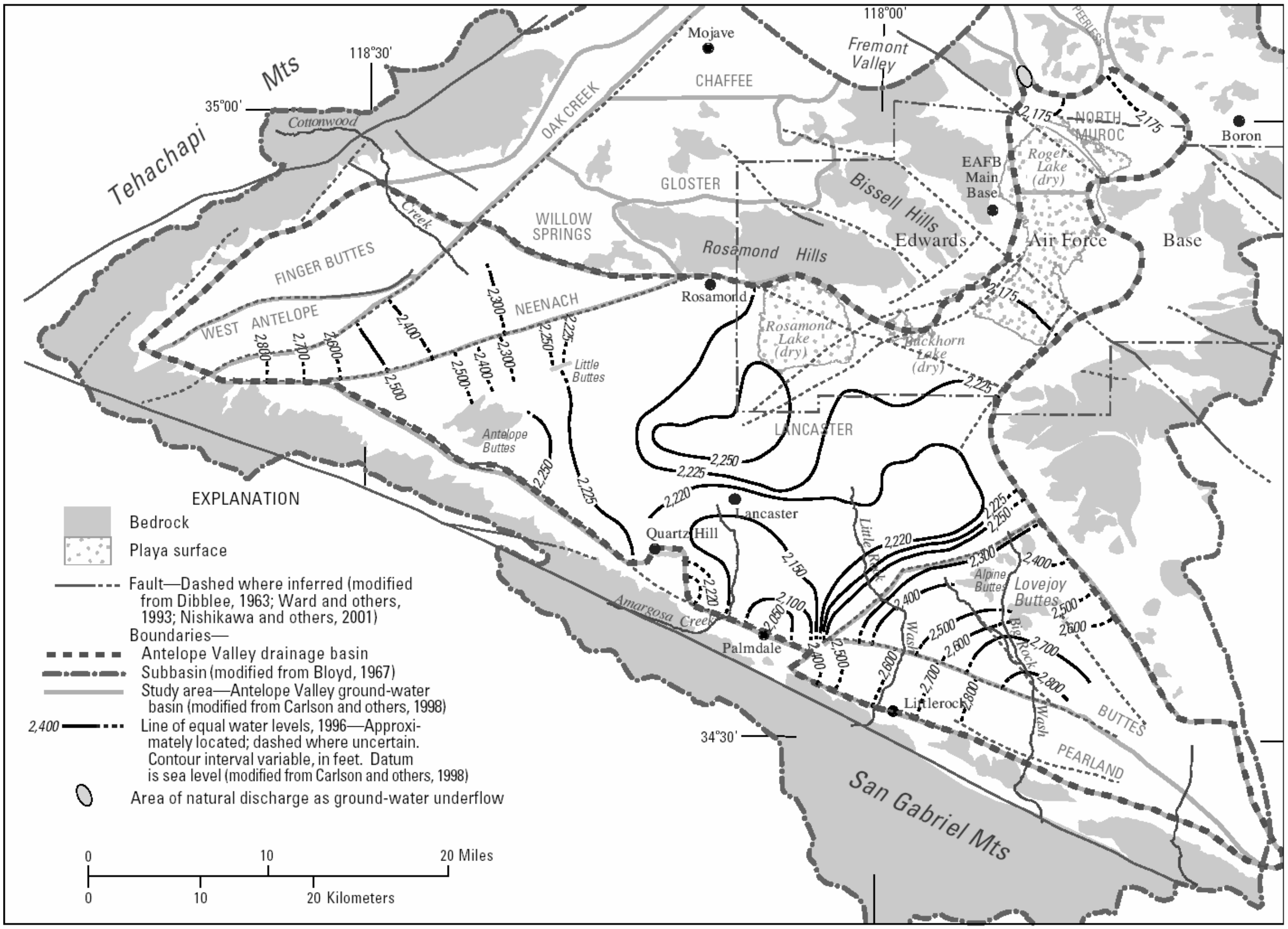


Figure 16: Spring 1996 Water Table Contours (USGS 2003)

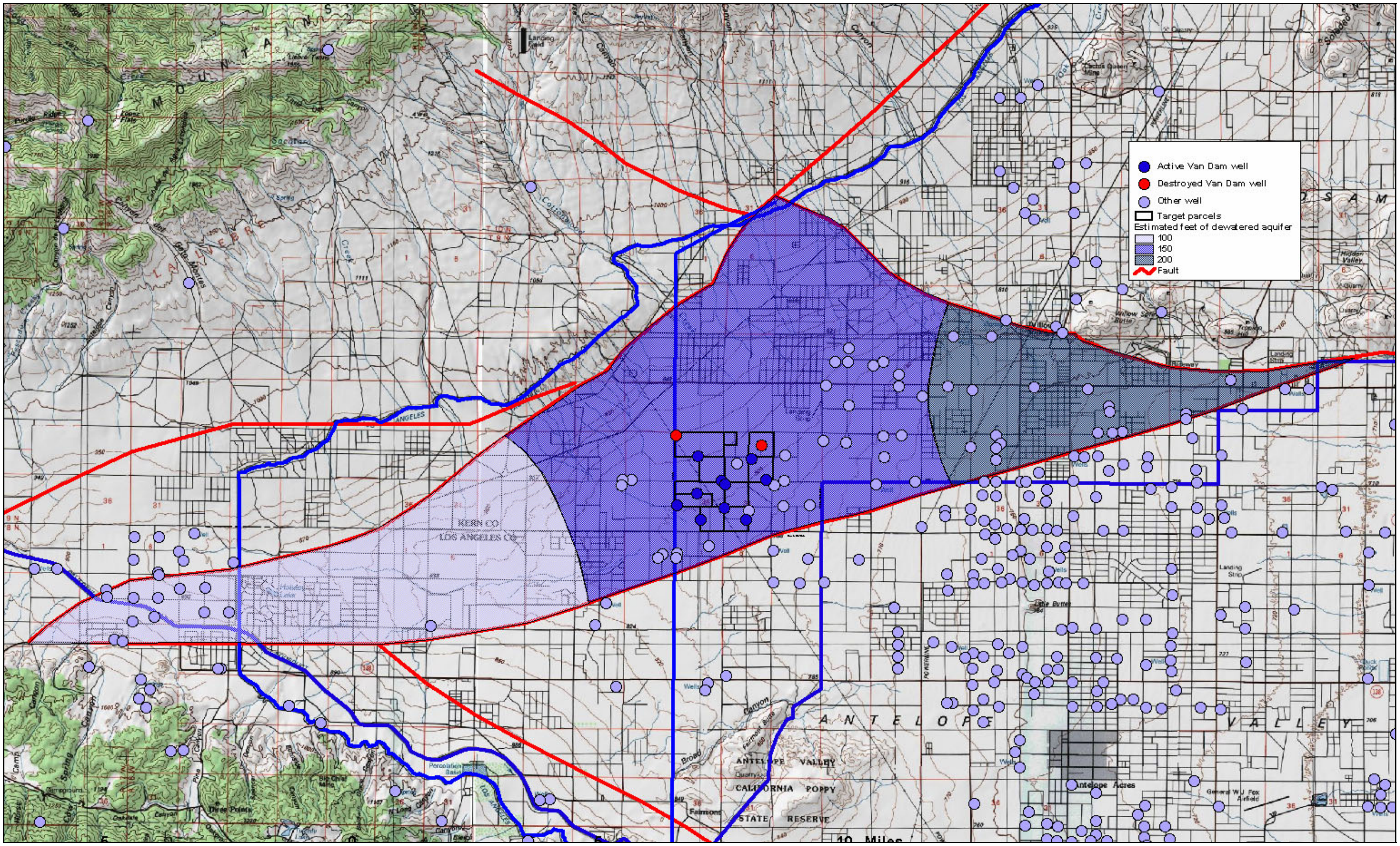


Figure 17: Estimated Feet of Dewatered Aquifer

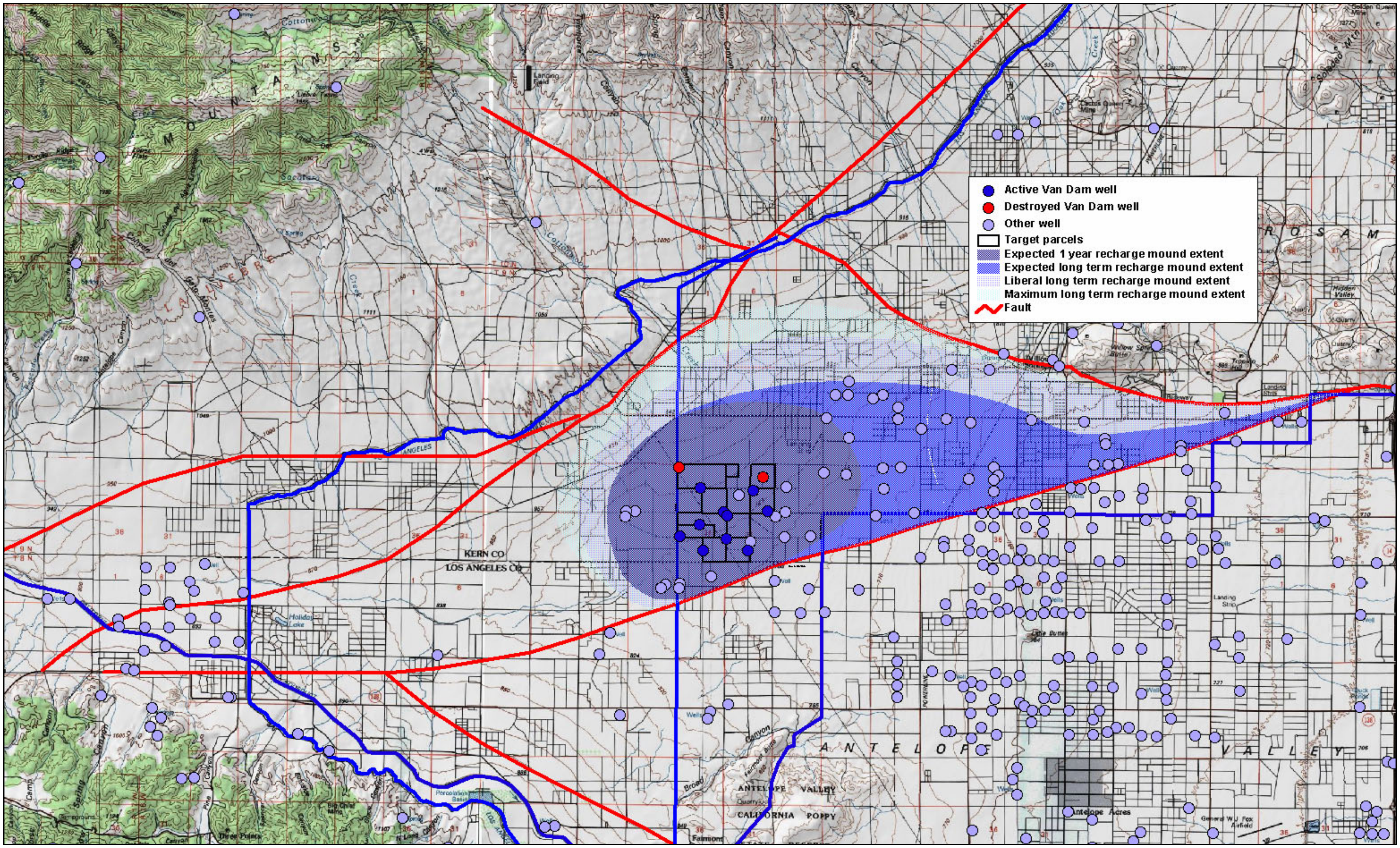


Figure 18: Preliminary Estimates of Recharge Mound Extents (does not account for periodic recovery)

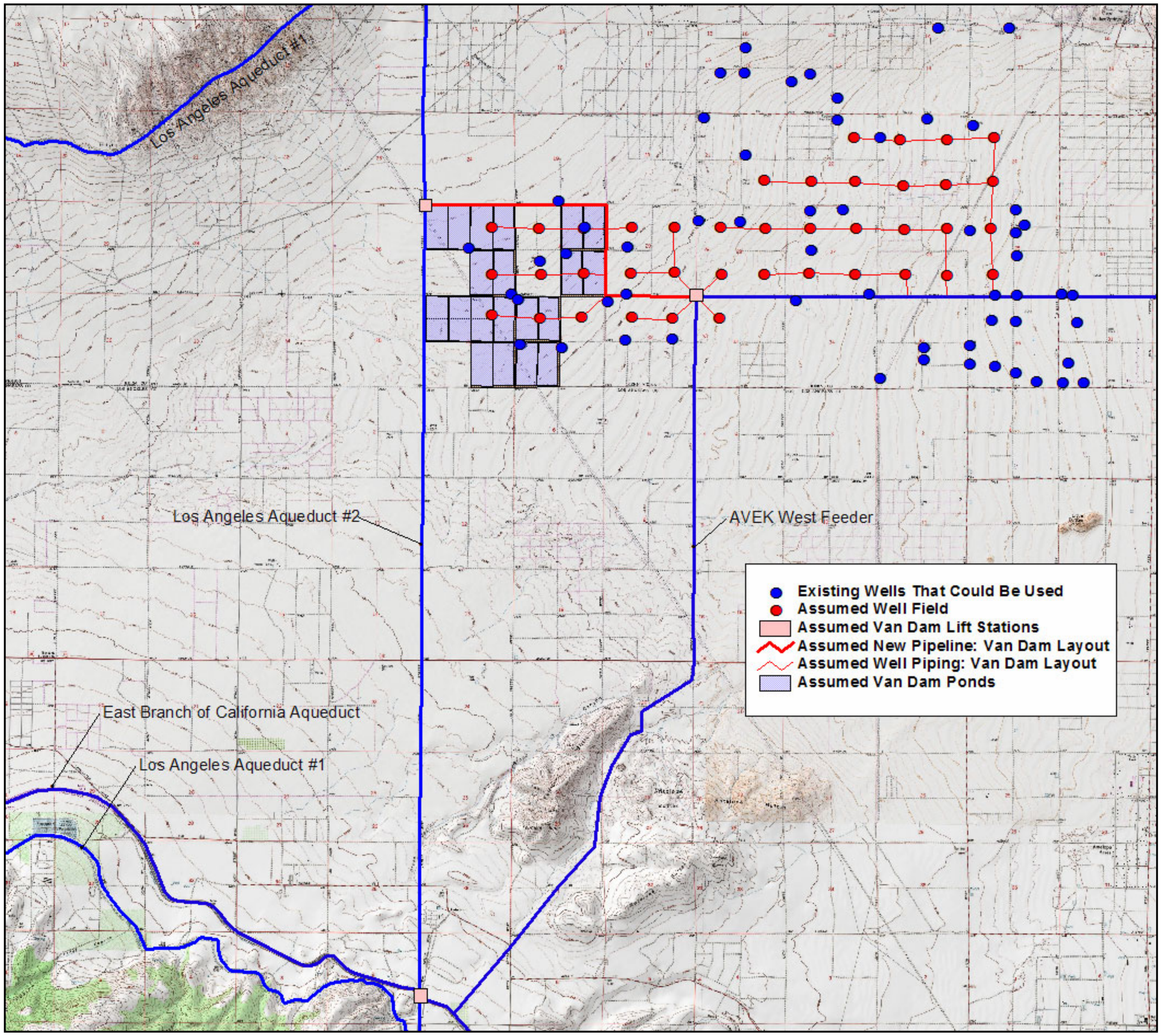


Figure 19: Alternative 3 Preliminary Layout Overview

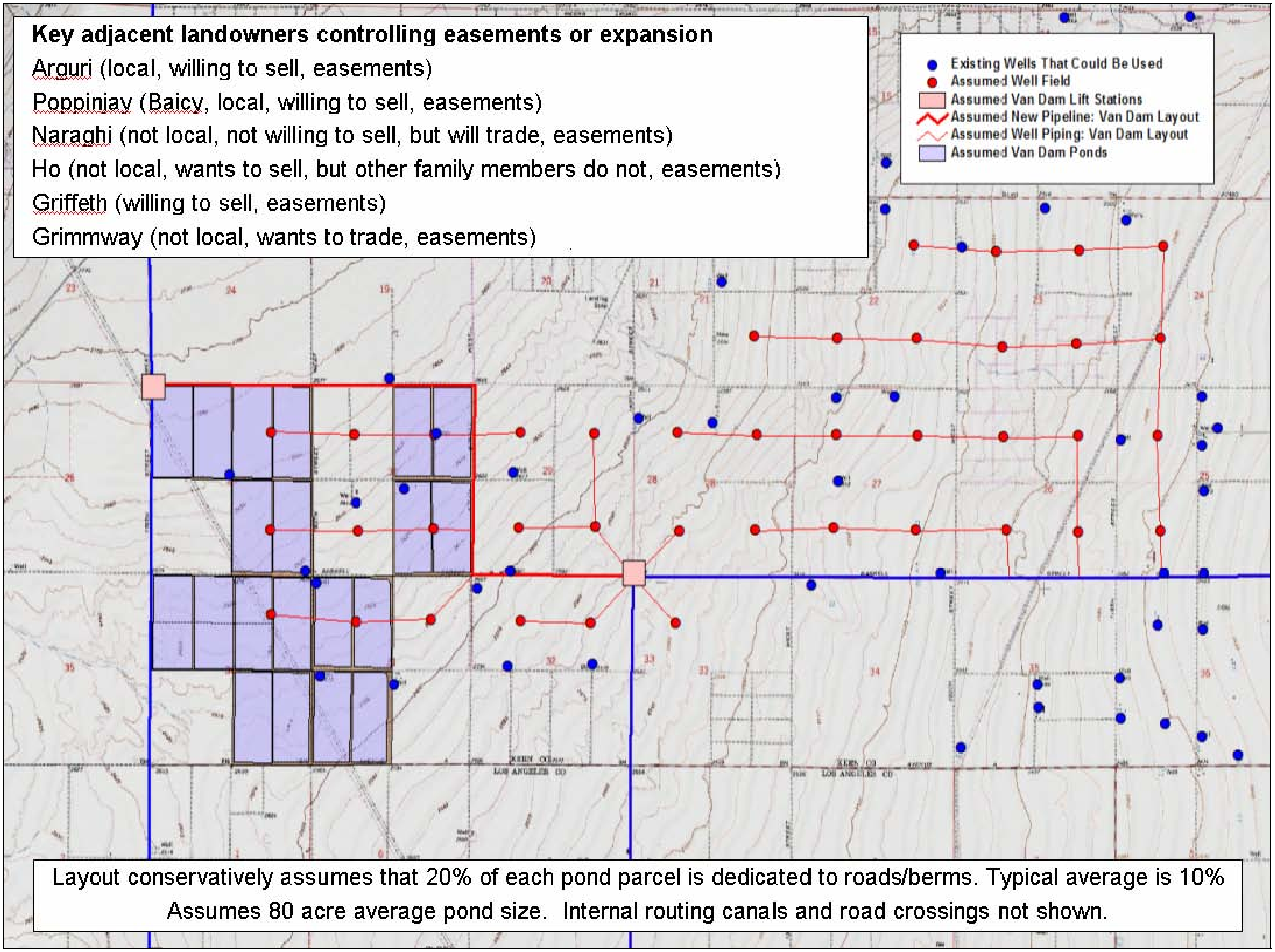


Figure 20: Alternative 3 Preliminary Layout Detail

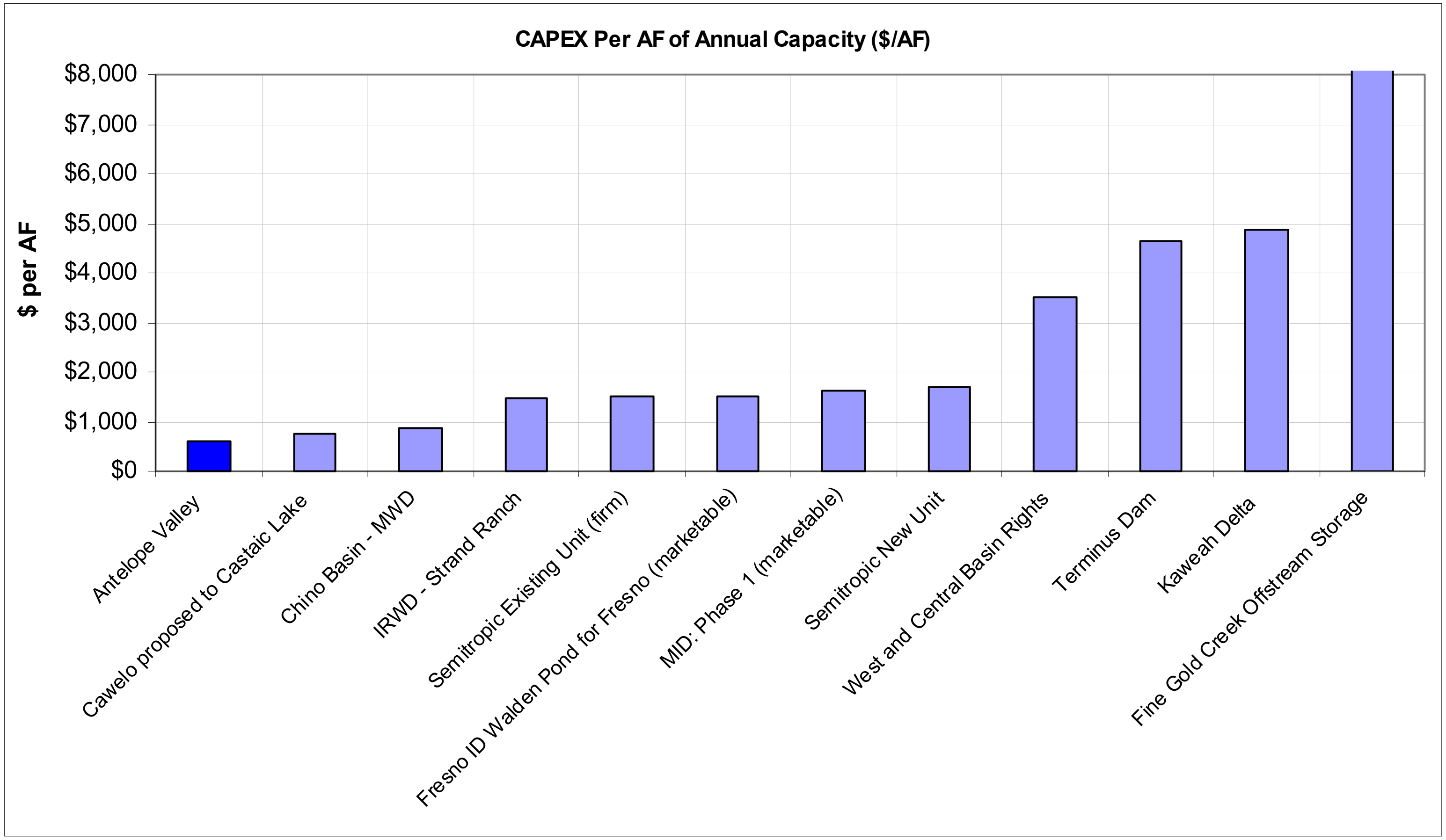


Figure 21: CAPEX Based Comparables Analysis

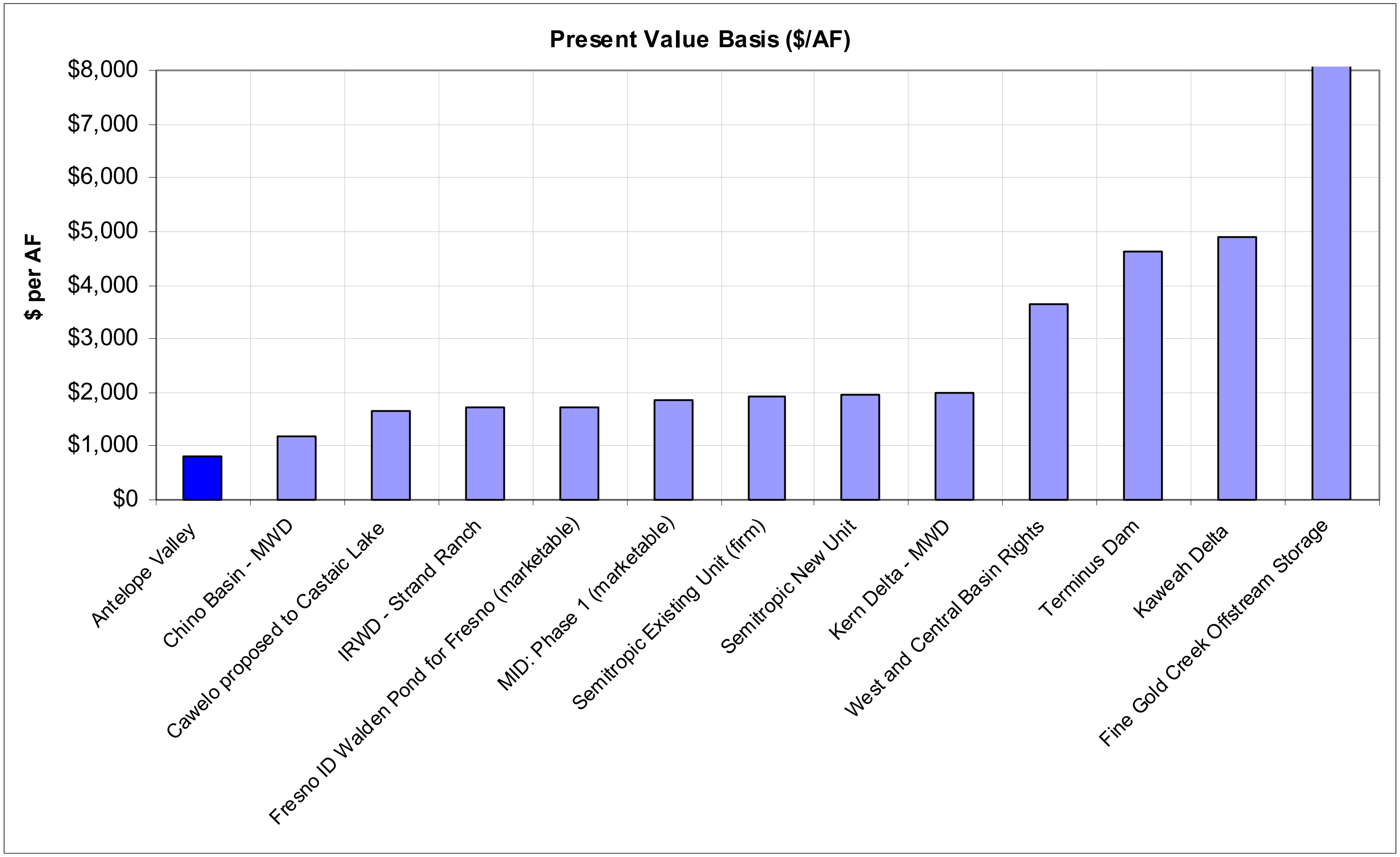


Figure 22: Present Value Based Comparables Analysis

Appendix A
WDS Statement of Qualifications

Water Conservation, Transfers, and Banking

Statement of Qualifications

5700 Wilshire Boulevard, Suite 330
Los Angeles, CA 90036
(323) 936 - 9303

Table of Contents

Introduction

Western Development and Storage, LLC (WDS) analyzes and develops water conservation, banking, and transfer projects as an investor, partner and consultant to private equity funds and public agencies. Because we manage our own assets, we bring clients a unique perspective on opportunities, risks, political factors, legal structures, permitting, technical issues, schedules and costs. Current projects include:

- Developing more than 1,550,000 acre-feet of storage (430,000 acre-feet/year of extraction);
- Managing and marketing more than 600 water rights in AZ, CA, CO, MT, NM, OR, TX, WA and UT totaling more than 120,000 AF;
- Managing more than 13,000 acres of Central Valley farmland (grapes, row crops and grazing);
- Expanding our successful crop-idling program;
- Permitting four dairies totaling 21,919 animal units; and
- Partnering with farmers, agricultural districts, urban water utilities, power utilities, private equity funds, large agribusinesses, real estate developers and the nation's largest railroad.

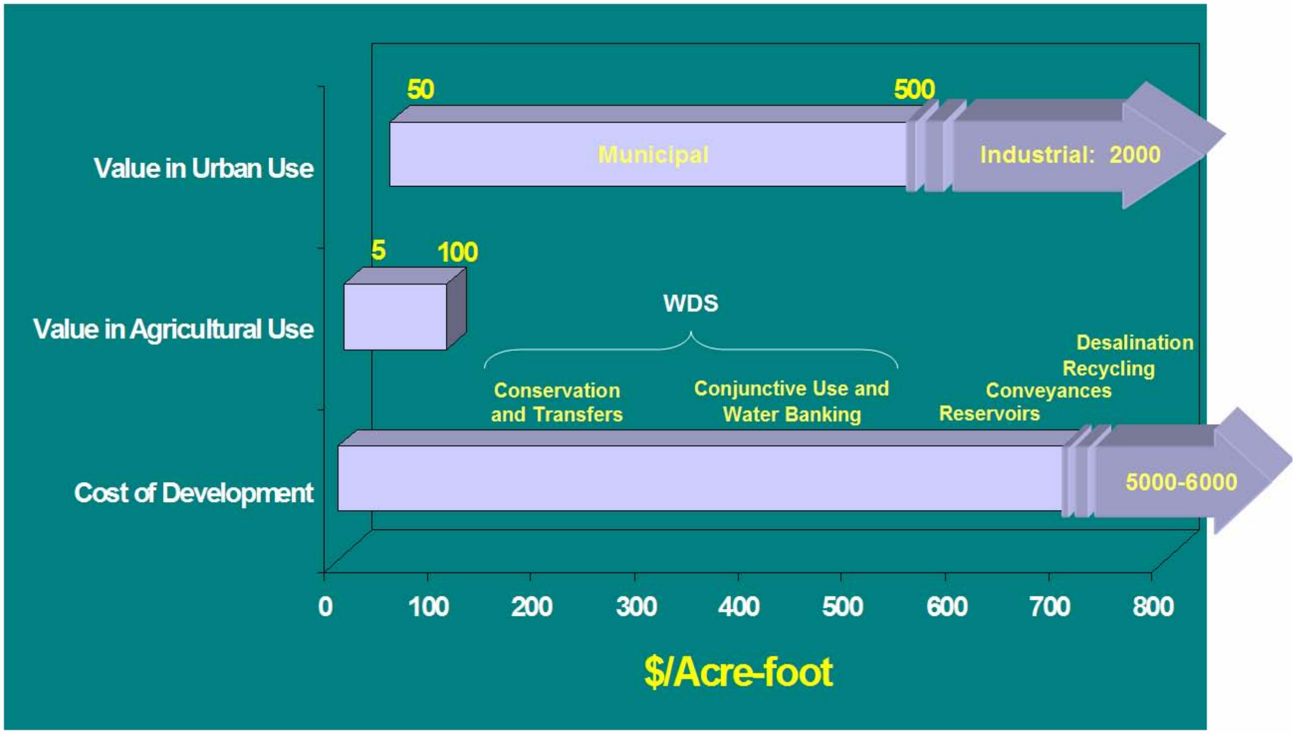
We have analyzed or been involved in every recent, significant California water-banking effort. Our unique protocols for evaluating opportunities, refined over many years, combine technical, regulatory, political and financial factors into succinct, quantitative recommendations and reports clients can use to obtain financing.

WDS is not an engineering company. We are developers who understand the issues, processes, players, opportunities and risks. We analyze and manage projects in house and outsource detailed engineering work to consultants such as Bookman-Edmonston, Boyle Engineering, Jones & Stokes, Geomatrix, Layne Christensen, Quad Knopf, URS Corporation and others. Accessing detailed expertise only where and when it is needed keeps operations lean, allowing us to remain financially efficient.

WDS applies highly selective, discerning criteria to the projects we evaluate. Of more than 235 opportunities screened in the past three years, we moved only 54 into detailed technical and financial analysis and recommended only 20 for implementation.

The WDS Vision

The California Department of Water Resources (DWR) estimates that a projected population increase of approximately 12 million people will increase water demand by four to eight million acre feet (MAF) per year by 2030 (Draft B160, June 2004). In certain years, water deficits already reach two to five MAF. The DWR intends to meet these current and future water needs through urban conservation, agricultural conservation (and transfer to urban use), conveyance improvements, conjunctive use, groundwater banking, desalination, recycling and new reservoirs. Arizona, Colorado, New Mexico, Nevada, Texas and Utah are experiencing similar conditions and making similar plans.



As indicated above, conservation, transfers, conjunctive use and water banking offer the most cost-effective "new" water sources. These projects are technically straightforward, simply involving water reallocation from one location to another (typically agricultural to urban) or from the wet to dry season. However, while capital costs are relatively low, the regulatory, legal and political issues are complex — commonly requiring cooperation of private, local, county, state and federal agencies. The complexity often causes good, cost-effective reallocation projects to languish due to lack of coordination and motivation alignment.

The WDS Vision

To enable good water conservation, transfer, conjunctive use and banking projects by providing a central point of coordination for regulatory, legal, financial, political and technical issues.

Guided by our corporate vision, we analyze, invest in and facilitate the following project types:

Aquifer Storage and Recovery (ASR)

These projects recharge excess surface water through ponds or injection wells for recovery at a later date. We are currently working on projects totaling more than 1,550,000 acre feet (AF) of storage (430,000 AF/year of extraction).

Conjunctive Use

The projects include wide variations, but typically entail using surface water in wet years instead of pumping groundwater – thus banking an equivalent amount of groundwater in the aquifer for use in dry years. It is common to integrate conjunctive use and ASR projects. Our efforts currently include more than 675,000 acre feet (125,000 AF/year) of conjunctive use.

Groundwater Pumpage Deferral

These short-term programs allow the owner of groundwater rights in an adjudicated basin to defer extraction and build up a "credit" volume the owner can sell to other parties. Carryover credits usually expire within one to five years. We are currently involved in pumpage deferral projects in AZ, CA, CO, MT, NM and WA.

Dry-Year Option Programs

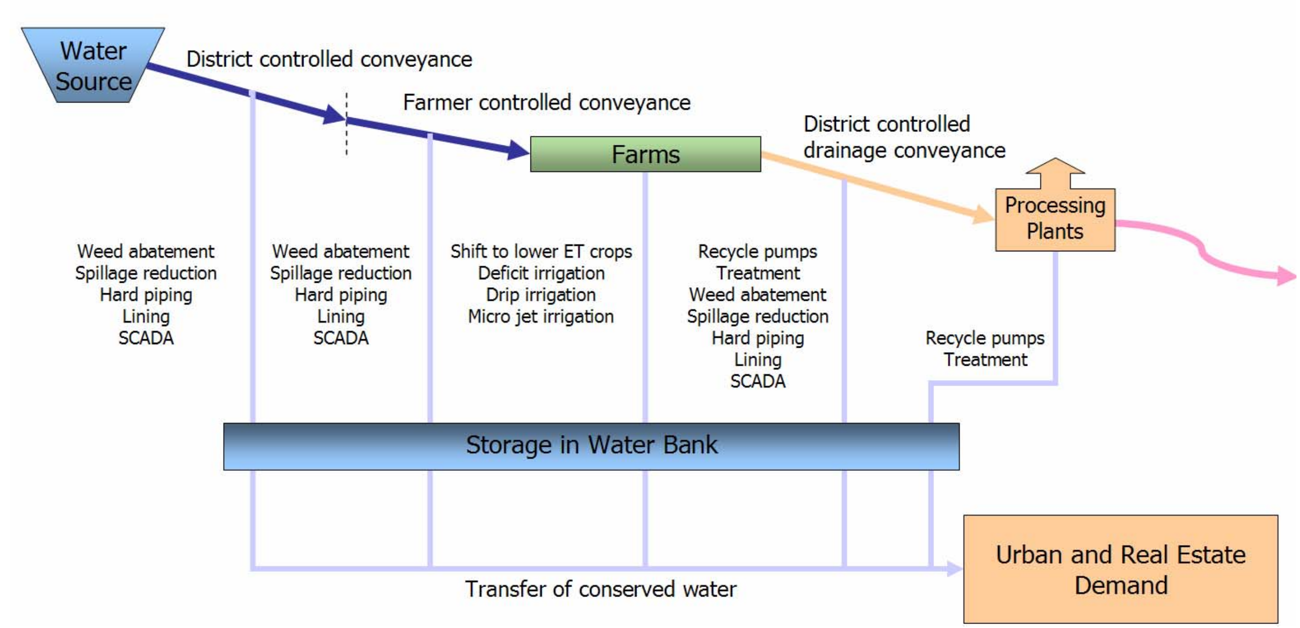
Rather than physically storing water, these projects enable a water rights owner to accept annual payments for the right to divert water to a buyer in dry years. We designed and permitted a 2003 rice-idling program that was copied by the majority of Sacramento Valley irrigation districts and resulted in more than 200,000 acre feet of option contracts. The WDS-managed program was the only project that successfully delivered water to customers south of the Delta. Based on this success, we are now implementing a long-term program that ties the price of transferred water to the price of rice.

Subsidized Water Conservation

In many cases, farmers cannot financially justify installing water conservation systems (i.e. drip irrigation) solely for agricultural reasons. Therefore, an entity seeking water can finance the conservation projects to improve agricultural operations for the farmer and make water available for transfer. We are completing a groundbreaking, two-year project to make Northern California agricultural water available for environmental uses. We also played an integral role in investor efforts to implement a 42,000-acre conservation project in the Imperial Irrigation District near the Colorado River.

Carryover Storage in Reservoirs

The majority of reservoirs are controlled by public agencies such as the Bureau of Reclamation, U.S. Army Corps of Engineers, California Department of Water Resources and a select list of large water utilities such as the Metropolitan Water District of Southern California. These agencies manipulate storage capacity for their own purposes and rarely make carryover storage available to third parties. However, other water banking efforts that can work in conjunction with surface water reservoirs are highly sought after. Almost all our projects have been specifically chosen to help optimize reservoir operations. In addition, we are marketing several high-desert reservoirs no longer needed by a railroad.



Over the years, a number of technically viable projects have failed because project architects did not address political and financial issues adequately. Conversely, political momentum has caused several flawed projects to linger for years. Accurate assessment of an opportunity requires a detailed understanding of past mistakes. Comprehensive assessment requires technical, regulatory, political and financial analysts who work in the market every day and know the projects, pitfalls and players.

Key Entities WDS Interacts With

Private Entities, Consultants and Attorneys

Allen Matkins Lock Gamble & Malley LLP
Akin Gump Strauss Hauer & Feld LLP
Baker, Mancock & Jensen
Bambauer Ag. Appraisal
Bookman-Edmonston (GEI)
Boyle Engineering
Cadiz, Inc.
Correia - Xavier Inc.
De Cuir & Somach
Geomatrix
Hatch & Parent
Hollister & Brace
Jones & Stokes
McCutchen, Doyle, Brown & Enersen, LLP
McMurrey & Hartsock
Minasian, Spruance, Baber, Meith, Soares & Sexton
Navigant Consulting
Progressive Dairy Design
Psomas
Quad Knopf
Selzer, Ealy, Hemphill & Blasdel, LLP
Snell & Wilmer
TRC Environmental
Stoel Rives
URS Corporation
West Water Research
Water Resources Information Management Engineering
Young and Wooldridge
Bellemont Water Company
Bolthouse Farms
Calpine
Cibola Resources
Farallon Capital
Ford Motor Company
Grimmway Farms
Jasman Development
KB Homes
Madera Agricultural Services
Milk Time Dairies
Newhall Land and Farming Co.
Paramount Farms
River West Investments
San Juan Southern Paiute Tribe
Staubach Property Management
Tejon Ranch
Tri-lest Dairies
The Nature Conservancy
US Filter Corporation
Urrutia Ranch Livestock & Farming
Wildlands, Inc.

Public Agencies

Alameda County WD
Arizona DWR, DEQ and Corporation Commission
California DWR, Water Transfers Office
California DWR Dry Year Water Account
California Department of Fish & Game
CALFED Environmental Water Account
California PUC
Castaic Lake WA
City of Stockton, CA
City of Tracy, CA
Central Coast WA
Chowchilla WD
Colorado DWR
Colorado River Indian Tribes
Contra Costa WD
East Bay MUD
Feather River Joint Districts
Fresno ID
Friant WA
Friant WUA
Kern Water Bank Authority
Kern County WA
Kings River CD
Gravelly Ford WD
Los Angeles Department of Water and Power
Lost Hills WD
Madera County
Metropolitan Water District of Southern California
Mojave Water Agency
Montana DNRC
Palo Verde ID
Phoenix Active Management Area
Root Creek WD
Rosedale Rio-Bravo WSD
Santa Margarita WD
San Luis WD
San Joaquin Exchange Contractors
(Firebaugh, CCID, San Luis CC, Colombia CC)
Santa Nella County WD
Santa Clara Valley WD
Shafter-Wasco ID
Southern Nevada WA
San Francisco PUC
US Bureau of Reclamation (USBR)
USBR Central Valley Project, Friant Unit
US Corp of Engineers
US Fish & Wildlife Service
Washington Department of Ecology
Westlands WD
Wheeler Ridge Maricopa WSD
Zone 7 WA

WDS Partners, Clients and References

As indicated below, we work with a unique combination of farmers, agricultural districts, urban water utilities, power utilities, private equity funds, large agribusinesses, real estate developers and the nation's largest railroad.

Private Entities	**Agencies and Public Entities**
AKT American States Water Calpine Castle & Cooke CIM Group Jane Capital JG Boswell Company Hudson Advisors Hydrogen Car Company Layne Christensen Company Lonestar Fund The Burlington Northern & Santa Fe Railway Company Van Dam Farms Woodridge Capital	Butte WD California State University Irvine Ranch WD Madera ID Semitropic WSD *In negotiation* Antelope Valley East Kern WA Littlerock Creek ID Palmdale WD San Gorgonio Pass WA

Semitropic Water Storage District (Kern County, CA)
Will Boschman, General Manager: (661) 758-5113
Regarding water banking and transfers

Butte Water District (Butte and Sutter Counties, CA)
Mark Orme, General Manager: (530) 846-3100
Regarding conserved water and fallowing programs

Madera Irrigation District (Madera County, CA)
Ron Pistoresi, Board President: (559) 907-4080
Regarding water banking and transfers

Irvine Ranch Water District (Irvine, CA)
Dick Diamond, Water Resources Manager: (949) 453-5594
Regarding property evaluation, water banking and transfers

Hudson Advisors (Lonestar Fund: Dallas, TX)
Joe Jernigan, Executive Vice President: (214) 754-8476
Regarding property management, dairy entitlement, water banking and the Cadiz project

The Burlington Northern and Santa Fe Railway Company (Dallas, TX)
Blaine Bilderback, Director Development and Acquisitions: (817) 352-6461
Regarding water rights management and marketing

Sample Recent Projects and Accomplishments

Project	Summary
Madera Ranch *Madera, CA*	WDS acquired a 13,646 acre ranch with Lonestar Fund and is: • Improving agricultural operations (revenues exceed plan by $1 million); • Redesigning a politically damaged water bank project in partnership with MID; • Permitting four dairies (21,919 animal units); and • Increasing property value by 2.3x (forecasted to be 4x within 12 months)
Cadiz, Inc. *Cadiz, CA*	WDS advised a financial institution on their investment in the Cadiz water bank project. Upon WDS' advice, the client sold their stake in Cadiz prior to collapse of the stock, saving the client approximately $20 million.
Butte 2003 WD Rice Idling Program *Gridley, CA*	WDS designed and permitted a rice-idling program that was imitated by the MWD. WDS successfully transferred water to customers south of the Delta and generated $1.2 million of revenue for an initial investment of approximately $25,000. In contrast, all water managed by the MWD program was lost.
Butte 2005-2009 Rice Idling Program *Gridley, CA*	Based on the success of the 2003 program, WDS has designed and is marketing a five-year rice-idling program that will tie the water price to that of rice – providing security to farmers and savings opportunities to buyers.
Butte WD Conserved Water Program *Gridley, CA*	WDS contributed two years of technical, regulatory and political work to monetize 8,500 to 20,000 AF of unused water rights. WDS coordinated with the DWR to prepare a groundbreaking analysis of historical uses and savings. Negotiations with several potential buyers, including the DWR, are ongoing.
The Burlington Northern & Santa Fe Railway Co. *Nationwide*	WDS is partnering with BNSF to catalogue, prioritize and market 124 years of water rights, land and equipment at more than 800 locations throughout the West. WDS is currently managing more than 40 transactions and is working almost daily with water agencies in AZ, CA, CO, MT, NM, OR, TX, WA regarding more than 100,000 AF of surface water, groundwater and storage rights.
Irvine Ranch WD *Irvine, CA*	WDS successfully introduced IRWD into the Kern County water-banking community and analyzed three alternate opportunities, resulting in the successful purchase of a ranch that will be incorporated into surrounding water banks. WDS is now evaluating alternate water supplies and helping to design an innovative partnership between IRWD and Semitropic WSD to expand existing banking operations.
Semitropic WSD *Wasco, CA*	WDS is marketing expansion to an existing water bank. The new unit will include 600,000 AF of storage, 150,000 AF/yr of extraction and 50,000 AF/yr of recharge capacity. WDS is interacting with most major CA municipal water agencies.
Antelope Valley Water Bank *Kern County, CA*	WDS invested three years and more than $600,000 to find the optimum location for a water bank to serve the needs of Southern California. WDS is now in partnering negotiations with three Kern County water agencies that would own the facility.
Hovey Trough *Fort Stockton, TX*	WDS analyzed and conceptually designed a project to export up to 75,000 AF/year of perennial yield from a previously unmapped aquifer to various cities in West Texas. WDS brought the project to the attention of prospective buyers, prepared business plans, and obtained approval from key surrounding ranchers.
Pastoria Power Plant *Kern County, CA*	Permitting of a 750 MW power plant had been stalled due to lack of a reliable water supply. WDS team members secured a unique supply including irrigation district turn-back water and water stored in the Kern Water Bank. The CEC called this a "first of its kind" portfolio and approved the project soon thereafter.
Carrizo-Wilcox *Burleson County, TX*	WDS advised three investor groups regarding a project to export groundwater to various cities. Each time, WDS did <u>not</u> recommend the investors participate based on economics and a participant's reputation. WDS advice was validated in June 2004 when the lead developer was convicted for misappropriation of funds.
Friant Unit of the CVP	WDS has identified and facilitated several transfers including the Exchange Contractors, Fresno ID, Madera ID, Semitropic WSD and Shafter-Wasco ID.

Services

We work with developers, farming companies and agencies to maximize the value of their water or procure reliable supplies through the following services:

- Identifying opportunities to monetize excess water, storage and land
- Evaluating potential water sources, storage projects and properties
- Managing, permitting and financing water transfers and banking projects
- Attending and reporting on agency meetings

Identifying Opportunities to Monetize Water, Storage and Properties

The water community perpetually struggles against two common ailments:

- Agencies and individuals that are "water rich but cash poor;" and
- Agencies and individuals that have abundant water at the wrong time of year.

We help clients identify opportunities to generate revenue from their excess water or to store wet season water for use at a later date. Water and storage capacity can be sold, leased or optioned to a variety of buyers. We help clients:

- Quantify water amounts that are excess and transferable
- Determine the financial structure and appropriate pricing
- Prepare offering memoranda and CEQA/NEPA project descriptions
- Identify and market to qualified buyers
- Negotiate terms and prepare contracts
- Identify and, if desired, subcontract with key experts to support the process
- Help obtain approvals from agencies such as the DWR, the State Water Resources Control Board (SWRCB), the Bureau of Reclamation and others
- Help prepare CEQA/NEPA documentation
- Help implement contractual obligations

The process described above is complicated and can take several years. Rather than acting in a broker's role, we facilitate the process by efficiently bringing together the key players and ensuring continuing progress, while minimizing cost and clients' distraction from their day-to-day affairs. We offer three types of commercial terms:

Consultant: WDS is compensated on a time-and-materials or fixed-fee basis.

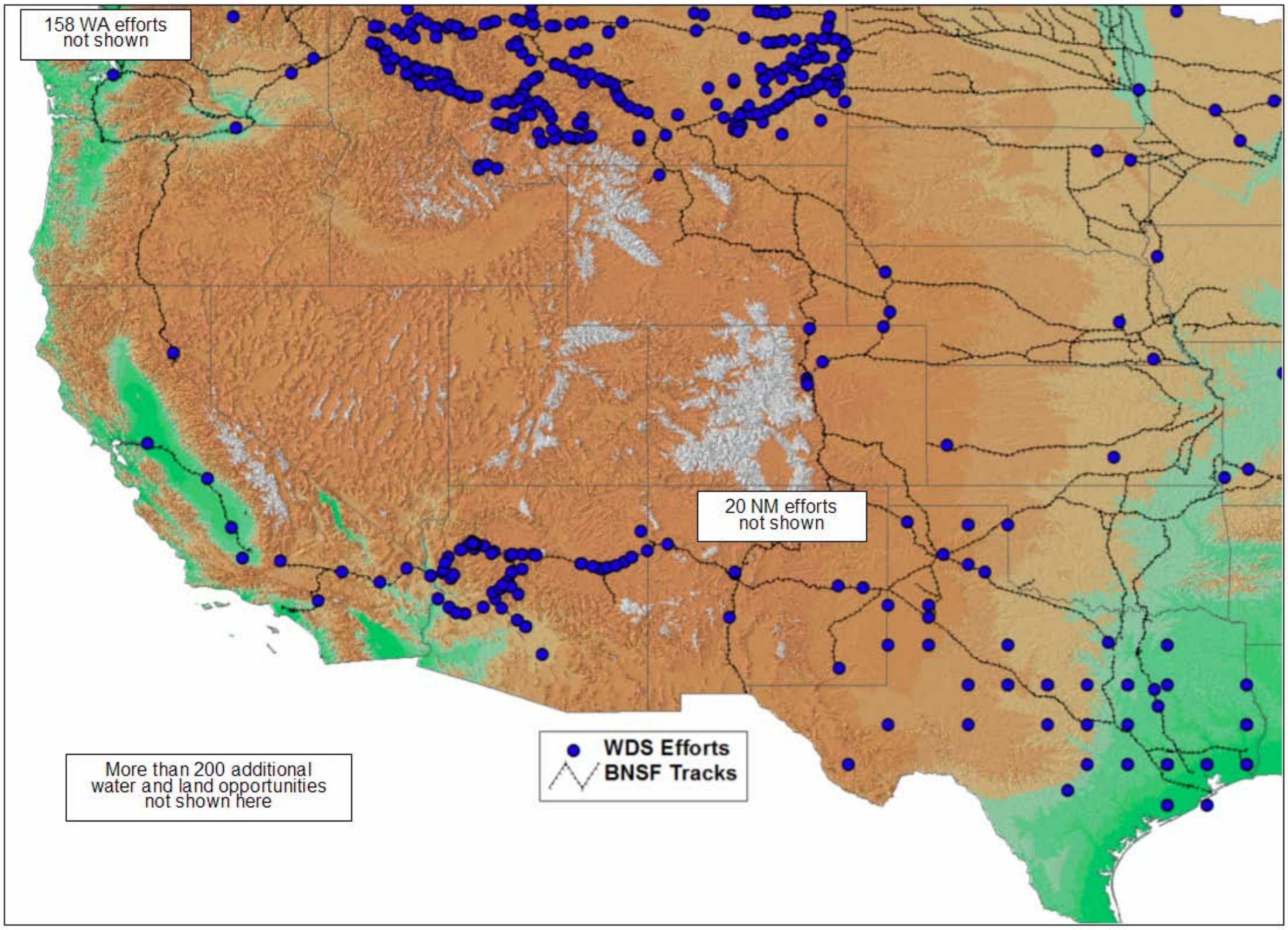
Retainer and Success Fee: WDS receives a reasonable retainer and a moderate percentage of proceeds from the successful project.

Partnership: WDS contributes expertise and expenses for a percentage of proceeds from the successful project.

Examples of WDS-Aided Monetization of Water and Storage

Project	Description
Butte Water District 2003 Rice Idling Program *Gridley, CA*	WDS transferred 11,699 AF and generated $1.2 million in revenue
Butte Water District 2005-2010 Rice Idling Program *Gridley, CA*	WDS has designed a program to transfer up to 12,404 AF/year with revenues averaging $1.9 million/year.
Butte Water District Conserved Water Program *Gridley, CA*	WDS has quantified and is working to transfer 8,500 to 20,000 AF/year of conserved water with anticipated revenues of at least $500,000 per year.
Lonestar Fund Sale of Utah Water Rights *Saratoga, UT*	WDS identified buyers, negotiated and contracted the sale of 276 AF of water rights for $469,000, providing a profit of approximately $365,000.
BNSF Arizona	WDS has researched, valued and marketed more than 40 water rights and several reservoirs including the Phoenix Active Management Area. Buyers have included investors, Indian tribes, utilities, agencies, industry and municipalities. Work has included sales, leases, a rate case and regulatory compliance.
BNSF California	WDS has researched, valued and marketed more than 20 water rights throughout the state including several adjudicated basins. Work has included sales, leases and regulatory compliance.
BNSF Colorado	WDS has researched, valued and marketed more than 10 water rights including 760 AF of Denver Basin rights in six aquifers. Work has included sales, partnering agreements, regulatory compliance and closures.
BNSF Montana	WDS is researching and marketing 359 water rights totalling 21,612 AF in the 42 basins.
BNSF New Mexico	WDS has researched and marketed more than 100 water rights throughout the state. Work includes leases, terminations, sales and regulatory compliance.
BNSF Texas	WDS has researched and marketed water rights, reservoirs and wells throughout the state. Work has included sales, leases and regulatory compliance.
BNSF Washington	WDS is researching and marketing 159 water rights totalling 79,987 AF. Work includes terminations, sales and regulatory compliance.
McAllister Ranch *Kern County, CA*	WDS evaluated options for the owner to perform water or storage transactions on a property entitled for real estate development. Work included regulatory, political, financial and technical analysis of five opportunities.
American States Water *California*	WDS is working to change PUC policies regarding acquisition and monetization of water resources.
California State University *Palm Desert, CA*	WDS (with Layne) evaluated water assets associated with a university-owned property.
Upper Feather River Basin *California*	WDS, working with farmers, designed a 20,000 AF forbearance project to make water available for hydroelectric and environmental purposes.

WDS Efforts on Behalf of BNSF



Evaluating Potential Water Sources, Storage Projects and Properties

WDS helps investors and agencies identify and evaluate projects and opportunities. For example, Irvine Ranch Water District had identified a need for approximately 60,000 AF of storage and inexpensive sources of water to store. We identified and screened three alternate storage opportunities and are evaluating more than 10 water sources, providing a prioritized list of recommendations. Likewise, we helped Castle & Cooke identify and evaluate five backup supplies for a real estate development near Fresno, CA.

WDS evaluates water supply and banking opportunities through integrating environmental, financial, regulatory, political, legal and technical issues. We first identify fatal flaws, if any. If there are no fatal flaws, we perform a life-cycle analysis using the following step-wise process.

Phase I: Technical, Political, Regulatory, and Financial Analyses

We typically complete Phase I in one month, culminating our analysis in a succinct Screening Due-Diligence Memorandum summarizing our findings and recommendations on the advisability of continuing to the next level of due diligence. If we have not identified any fatal flaws, we also provide a detailed scope, schedule and budget for Final Due Diligence. Our evaluations typically include:

1. Identify client requirements relating to:
    - Maximum allowable time to bring online
    - Minimum annual yield (AF/yr)
    - Maximum allowable capital cost (CAPEX) and annual operating cost (OPEX)

2. Identify any potential fatal flaws.
    - Soils: percolation rate too low (e.g. <0.2 feet/day)
    - Low aquifer transmissivity (e.g. <500 gpm per well)
    - Leachable soil salinity or residual agrichemicals
    - Water table too shallow (e.g. <50 feet)
    - Water quality: groundwater requires treatment upon extraction (e.g. arsenic)
    - Distance to regional conveyances (e.g. >5 miles to California aqueduct)
    - Distance to power grid or natural gas pipelines (for pumps)
    - Lack of wheeling capacity in regional conveyances
    - Pumping costs (depth to water and topography)
    - Past land use that has left behind contamination (e.g. improper oilfield closure)
    - Special status water bodies, habitats or species (CWA, NEPA, ESA, CEQA)
    - District/county ordinances limiting pumpage or recharge of lower quality water
    - Interference with other banking or groundwater pumpage activities
    - Inability to obtain right-of-way for new conveyances from project to aqueduct
    - Known and vocal local opposition
    - CAPEX or OPEX that exceed client limit
    - Annual yield less than client minimum

3. Using existing sources, determine if any of the fatal flaws are present.
    - AB3030 plans and county records reviews
    - DWR databases for groundwater levels and quality
    - Layne Christensen records of wells and projects in the vicinity
    - EPA databases (RCRA, CERCLA, USTs, FERC, etc.)
    - Soil Conservation Service surveys and USGS reports
    - Physical inspection and mapping of features with a GPS unit
    - County and farm bureau records on herbicide/pesticide application
    - GIS analysis of proximity to water, gas and electricity transmission systems
    - Statistical analysis of wheeling capacities in wet, dry and critical years
    - Review of various agency reports and plans
    - Review of historical aerial photographs for past land use
    - Review of district and county rules and ordinances
    - Comparables analysis with other transactions and facilities
    - Screening CAPEX and OPEX estimates

4. Evaluate water supply.
    - Description, location, type, perfection and seniority
    - Availability in wet, normal and dry years
    - Months of availability
    - Controlling entities (both at source and in conveyances)
    - Methods for delivery into storage
    - Quality and acceptability in conveyances
    - Pricing and comparable transactions
    - Likely contract structures
    - Ability to market excess water

5. Identify regulatory and political issues.
    - Unincorporated areas and the pros and cons of being in one
    - Review of district and county rules and ordinances
    - Quiet discussions with key agencies
    - Quiet discussions with trusted brokers, farmers and district managers
    - Review of partnership opportunities with adjacent districts
    - Review of appropriate regulatory vehicles
    - Review of local politics and those who might be for and against the project

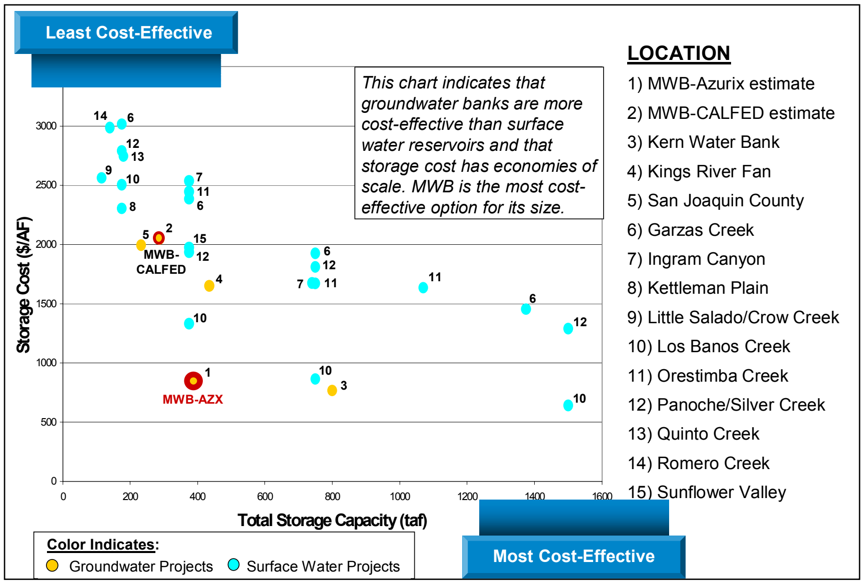
6. Assess financial outlook.
    - Comparable land sales in the area
    - Lease income and cash flow models
    - Water acquisition models and additional costs
    - Farming plan
    - Debt and equity analysis and the ability to lay off any risks

<u>Phase II: Final Due-Diligence Evaluations</u>

The scope of Final Due-Diligence Evaluations varies from project to project, but typically includes the following:

- Sampling of existing wells to verify groundwater quality
- Inexpensive backhoe trenching or direct push testing with simple percolation tests to verify soil suitability
- A limited number of boreholes
- Step-drawdown testing of existing wells to confirm production rates
- Screening biological inspections to estimate the need for habitat mitigation
- Detailed discussions with adjacent districts, local, state and federal agencies
- Preliminary discussions with adjacent landowners and right-of-way holders
- Conceptual specification of system layout with cost estimates (plus or minus 20%)
- Analysis of financing mechanisms, including grants or low interest loans
- Property transfer environmental due diligence compliant with ASTM standards
- Political analysis of permitting pathways, local benefits that can be accrued and methods to mitigate potential local impacts

In the Final Due-Diligence Report, usually completed within 60 days, we make final recommendations regarding the advisability of continuing with the project. If we recommend pursuing the project, we also provide a detailed implementation plan and cost estimate suitable for use in financing efforts. The plan typically includes:



- Overview of the project and its capacity
- Critical path schedule for permitting, construction and operation
- Optimal structure for financing, ownership and operation
- Local partnerships (if any) required to facilitate permitting, access to grants and long-term success of the project
- Preliminary footprint of facilities and mitigation lands
- Water acquisition plan
- Farming plan
- Detailed time-phased breakout of design, construction, operation, right-of-way and mitigation costs
- If appropriate, a levered financial model taking into account revenue, debt service, inflation, depreciation, amortization, taxes and payouts to equity stakeholders
- Detailed regulatory compliance and permitting plan
- Property transfer environmental liability assessment that is compliant with ASTM and California real estate transaction standards
- Exit strategy plans and financial results in the event that banking efforts fail.

We perform the type of work summarized above under several contract types:

Consultant: WDS is compensated on a time & materials or fixed fee basis.

Deferred Payment: WDS contributes expertise and expenses in exchange for a management contract if the project proceeds.

Partnership: WDS performs all due diligence as an equity contribution to the project if it proceeds.

Examples of WDS Evaluation Projects

Project	Description
Castle & Cooke: Gateway Village *Fresno, CA*	WDS evaluated backup supplies for a real estate development in Madera County.
IID Transfers *Imperial Irrigation District, CA*	WDS evaluated potential purchase of 42,000 acres to be followed by transfer of senior Colorado River water rights to urban use.
Delta Wetlands Project *San Joaquin – Sacramento Delta, CA*	WDS performed financial, technical and regulatory evaluations of the Delta Wetlands Project for two potential investor groups.
Schofield and Twisselman Ranches *Lost Hills, CA*	WDS evaluated potential purchase of 22,000 acres accompanied by 16,000 AF of state water project entitlement.
Palo Verde ID *Palo Verde, CA*	WDS evaluated potential purchase of 16,344 acres followed by transfer of 37,469 AF of senior Colorado River water rights.
Rudnick Land *Kern County, CA*	WDS evaluated potential purchase of 67,000 acres and associated water rights.
Adjudicated Mojave Groundwater Basins *San Bernardino to Barstow, CA*	WDS evaluated potential purchase/sale of groundwater rights for several investment groups.
Baca Ranch *San Luis Valley, CO*	WDS team members evaluated a project to export 150,000 AF/year of groundwater to the Front Range.
Enron/Azurix *Nationwide*	WDS evaluated and guided the purchase of Azurix water and land assets.
Carrizo-Wilcox *Central, TX*	WDS evaluated a project to export rural groundwater to Austin and San Antonio.
Mesa Water *TX Panhandle*	WDS evaluated a project to export Ogallala groundwater to Dallas.
Fanucchi Ranch *Kern County, CA*	WDS evaluated 320 acres for potential incorporation into adjacent water banks.
Strand Ranch *Kern County, CA*	WDS evaluated 640 acres for potential incorporation into adjacent water banks
Semitropic lands *Kern County, CA*	WDS is evaluating 2,500 acres for potential incorporation into the Semitropic water bank.
Supplemental water supplies *CA Central Valley*	WDS is evaluating 10 alternate sources of wet-year water for placement into storage.
Texas Pacific Land Trust *Texas*	WDS evaluated a portfolio of more than one million acres for potential water and wind-power opportunities.
Cadiz, Inc. *Cadiz, CA*	WDS evaluated and provided advice regarding investment in a water banking project.
Vidler Water Company *Southwest*	WDS evaluated and provided advice on potential acquisition of the company by several investors.
Broadview WD *CA Central Valley*	WDS evaluated potential purchase, water transfer and habitat banking opportunities.
Edwards Aquifer *Kinney County, TX*	WDS evaluated a project to export groundwater to San Antonio.
Hidden Valley *Las Vegas, NV*	WDS team members evaluated a project to prospect groundwater for a power plant.
Coppins Meadows, Quinto Ranch, Ritter Ranch, Desert Center, Casy Ranch, Conway Ranch, River Ranch, various Washoe Valley properties, and McCallister Ranch, Newhall Ranch *Throughout the Southwest*	WDS evaluated these and other properties for acquisition followed by water transfer or storage projects.

Contracting, Permitting and Managing Water Projects and Properties

Water projects typically entail acquiring real property and water entitlements followed by permitting, contracting, design and construction. WDS is retained to perform the following functions:

1. Property Management
   - File local, county, state and federal property transfer documentation
   - Identify, negotiate and manage agricultural leases
   - Collect and distribute revenue
   - Perform county, state and federal enterprise record keeping and paying taxes
   - Negotiate, order and make payments on water contract
   - Manage agricultural run-off waivers
   - Maintain subsurface assets (wells and piping)
   - Inspect above-surface assets being maintained by tenants
   - Develop and negotiate long-term agricultural business plans

2. Permitting
   - Carefully develop a project description that is not too broad or narrow
   - Identify, prioritize and outline a critical path for required permits
   - Develop detailed scope of work and RFPs for consultants
   - Select, negotiate and contract with consultants
   - Perform day-to-day consultant management
   - Handle day-to-day agency interactions
   - Manage budgets and schedules
   - Negotiate with agencies

3. Grants, Loans and Financing
   - Identify, apply for and lobby for grants and low-interest government loans
   - If desired, prepare offering documents for private financing
   - Present to and negotiate with private financing sources
   - Generate documentation to support bond and other public finance efforts
   - Develop structures, contracts, proformas and documents to project finance through leasing of capacity to third parties
   - Market excess capacity to raise capital
   - Negotiate and contract with project tenants

4. Transition Management
   - Following entitlement and financing, prepare detailed RFPs for design-build contracts
   - Aid in contractor selection
   - Transfer day-to-day management to the operating entity – including helping to define additional staffing and administrative needs to operate the new facility.

From beginning to end, our involvement in the process defined above can span two to five years. Contracts typically include incentives that encourage us to minimize costs and complete permitting/financing as quickly as possible. Key elements of our contracts are:

- A moderate retainer to cover WDS time and expenses at cost;
- Direct payment to third parties with no mark-up to WDS;
- A deferred fee paid at upon successful project permitting or financing; and
- A decrease in the WDS fee as the time to permit or finance increases.

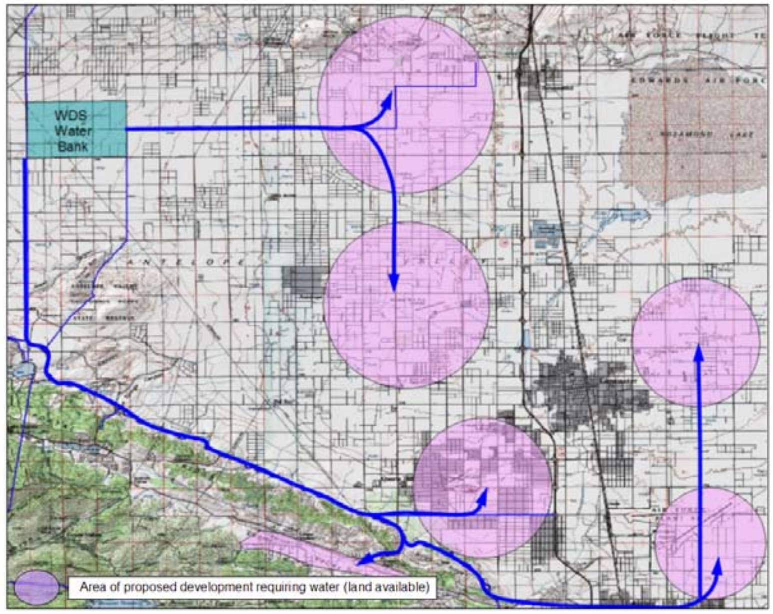
Examples of WDS projects to manage water transfer and banking projects are summarized in the following table.

Examples of WDS Management Projects

Project	Description
Madera Ranch *Madera, CA*	WDS has: • Improved agricultural operations with revenues exceeding plan by $1 million; • Negotiated a partnership with Madera ID to meet local needs through careful redesign of a politically damaged water bank; • Designed and is permitting four dairies; • Demonstrated exemption from agricultural run-off monitoring requirements; • Contracted with and managing six consultants; • Leading CEQA and NEPA compliance efforts with Madera County, U.S. Fish & Wildlife Service, CA Department of Fish & Game, U. S. Army Corps of Engineers, Regional Water Quality Control Board; • Leading efforts to obtain grants and project financing; • Marketing excess habitat to the Nature Conservancy and others; and • Obtained several offers for the ranch at a significant premium above the original investment.
Pastoria Power Plant *Kern County, CA*	Permitting of a 750 MW power plant had been stalled due to lack of a reliable water supply. WDS team members secured a unique supply including irrigation district turn-back water and water stored in the Kern Water Bank. The CEC called this a “first of its kind” portfolio and approved the project soon thereafter. WDS work included negotiation and contracting with Wheeler-Ridge Maricopa WSD, the Kern County Water Agency, several other Kern County water districts, the CEC and a variety of other entities.
Hovey Trough *Fort Stockton, TX*	WDS analyzed and conceptually designed a project to export up to 75,000 AF/year of perennial yield from a previously un-mapped aquifer to various cities in West Texas. WDS brought the project to the attention of prospective buyers, prepared business plans, and obtained approval from key surrounding ranchers.
Antelope Valley Water Bank *Kern County, CA*	WDS has invested three years and more than $600,000 to find the optimum location for a water bank to serve the needs of Southern California. WDS is now in partnering negotiations with three Kern County water agencies that would own the facility. WDS work has included a sophisticated, GIS-based screening of more than 400 square miles, hydrogeologic investigations, modelling, discussions with more than 40 landowners, land optioning, formulating consensus among key water agencies and structuring contracts that benefit the community, the county, the environment and Southern California municipalities.

Attending and Reporting on Agency Meetings

As a part of our day-to-day business, we routinely attend numerous water agency meetings. The content, tone and attendance of these meetings are not adequately summarized in the formal minutes typically issued 30 days later. In addition, we frequently find that the undocumented sidebar discussions before, during and after these meetings are of significant interest. Therefore, we make available, at a nominal monthly fee of $500, our notes from the following monthly meetings:



- Antelope Valley East Kern Water Agency;
- Antelope Valley State Water Project Contractor Association;
- Chowchilla WD (twice a month, periodic conflicts with Fresno ID);
- Exchange Contractors (once a month);
- Fresno ID (1-2 times per month);
- Friant Water Authority (once a month);
- Friant Water Users Authority (once a month);
- James ID (once a month);
- Kern Water Bank Authority (once a month);
- Kern County Water Agency (once a month);
- Madera ID (twice a month);
- San Joaquin River Task Force (once a month);
- Consolidated ID;
- Kings River Conservation District;
- Kings River Water Association;
- Littlerock Creek ID;
- Madera County Board of Supervisors (And Water Oversight Committee);
- Palmdale WD;
- San Joaquin River Resource Management Coalition (once a month); and
- Westlands WD (once a month).

We can attend additional agency meetings, not listed above, upon request (assuming no conflicts) at a cost of $200 per meeting per month.

Excerpt from a Recent WDS Meeting Report

Friant Water Users Authority/FWA May 27, 2004
By Don A. Wright

The Friant Water Users Authority/Friant Water Authority met in Visalia, California in joint session. Much of the first part of the meeting was immersed in discussions of how the minutes should reflect past controversy. Once again it's Madera Irrigation District against the world. As usual, frustrations are running high and in my opinion, the truth is suffering. Selective inclusions and exclusions of the revised content have been very biased. I'm not taking sides on this, but I was at the meetings in question and have seen first hand that what happened is not what was reflected in the minutes. It's a simple as that.

Another issue pointed out to me in regards to closed sessions and the Brown Act continues to peck away at the proceedings. When the new authority met in closed session it discussed filing a CEQA lawsuit and hiring an attorney to represent it in suing Central Green. The question posed was; if the FWA only has O&M functions, as it has attested to many times, how can it meet in closed session to discuss a CEQA lawsuit which is a general member function? Supposedly FWA has no general member authority. One attorney said this is clearly a secrete meeting and thus violates the Brown Act. Another attorney I spoke with said the new authority can enter into this lawsuit if it chooses to. He felt there was no limitation in this particular matter.

Additions to the agenda included changing the order of items to accommodate several of the lawyers in attendance. Item 3 is minutes development, an effort to reach consensus of how much detail should be included in the minutes. Ron Jacobsma said staff has tried to cover as much as possible but staff needs to know the boards' desire. Previous minutes have been tabled. One member said the minutes have been adequate and Steve Collup of Arvin-Edison agreed. Ron Pistoresi of Madera ID said for the past few meetings the minutes have been good because there have been controversies. Collup said he meant the past few years and Thewis Atsma of Pixley ID agreed. This raised the issue of what is the truth. Jacobsma said staff will continue on its present course and not turn the minutes into transcriptions.

Next, tabled minutes of March, 25th. Tom Runyon of Stone Corral ID moved to approve minutes until he found out they'd been corrected. Pistoresi moved to accept minutes as altered and Lucille Demetriff of Saucelito ID seconded. The corrections included portions of a letter from MID. Jacobsma outlined the changes. Collup asked if anyone addressed the points MID raised. The discussion turned to when does corrections become a point of clarification of position and not just adding more detail.

Collup asked when a jurisdictional matter arises can the new authority discuss the issue if it affects the old authority. Nothing that the new authority does can bind the old authority was the point taken from special counsel Robbin's opinion. It was suggested the opinion be attached to the minutes and Tim Swickard, counsel to MID said that would be fine with MID but that's going into more detail. Sean Geivet of Terra Bella ID said the minutes should capture the flavor of the board and except some changes but not a negotiation of the words. Pistoresi said the idea is for corrections, he's bringing additions to clarify the issue not ignore the truth. Kole Upton said he'd like to get things going on this item and staff has done a good job, ". . . there's a motion, vote yes or no." The vote had to be taken roll call and failed.

There was a motion to accept the minutes as originally written and with all changes except for what MID added. Steve Ottemoeller said the intent of MID's changes was to characterize the changes accurately and MID doesn't want Swickard's opinion misrepresented. Pistoresi said Dan Vink's, Lower Tule River ID, statement to be changed is no different than MID's and should not be changed. Then it broke down to semantics. No one actually understood the motion. Jacobsma said the motion is to accept additions except for MID's additional language that was underlined. Pistoresi wants it clarified in this meetings minutes that MID's response to this issue be included and these actions were disrespectful to MID.

Attorneys Ernest Conant and Tim Swickard were asked to not speak anymore on this matter. The vote was passed and Upton invited anyone who didn't agree with the minutes to write a letter to be included in the files. Item 4 and 5 were passed without comment.

Item 7 was the Unanimous consent provision of the JPA and Brown Act issues. This item was held off until later in the meeting.

Item 8, it was passed to pay the bills. There were no questions about cash activity and the general fund has been borrowing from the O&M fund. A call for funds is needed; NRDC litigation costs are running high. The call for funds is for $210,000 and was so moved. Pistoresi asked why the funds have gotten much higher. Jacobsma said the attorneys have had to compress their work to be ready for the accelerated court date and hire more help which has raised costs. This is a cash crunch but should ease up. The vote passed.

WDS Team

WDS is a diverse team with overlapping skills that ensure a project's critical path is adequately covered. The following sections provide background on each team member.

WDS Experience Matrix

Team Member	Years Experience	Financing	Economics	Legal	Regulatory	Technical	Political
David Freeman	50+			●	●	●	●
Cole Frates	10	●	●		●		●
Dave Dorrance	20		●		●	●	
Andrew Werner	10		●		●	●	
Ari Swiller	10	●					●
Affiliates							
Charlie Stringer	15			●	●		●
Douglas Boxer	21			●	●		●
Don Wright	17						●
Total Years	**153+**	**20**	**40**	**86+**	**136+**	**80+**	**123+**

S. DAVID FREEMAN

S. David Freeman's career spans more than five decades in both the electric and water utility industries. He has served in various high-level federal government posts, including energy advisor to President Jimmy Carter, energy consultant to the U.S. Senate Commerce Committee, and executive assistant to the chairman of the Federal Power Commission. Mr. Freeman's experience includes chairing the California Consumer Power and Conservation Financing Authority and serving as the California governor's senior energy advisor. He has also held top positions at the Los Angeles Department of Water and Power (LADWP), New York Power Authority (NYPA), Sacramento Municipal Utility District (SMUD), Tennessee Valley Authority (TVA), and the Lower Colorado River Authority.

Mr. Freeman is an engineer, lawyer, and author. His book, Energy: The New Era, outlined the impending crisis of a fossil-fuel-based economy before it became fashionable to discuss automobile fuel standards. He earned a bachelor of science degree in civil engineering from Georgia Tech and a law degree from the University of Tennessee Law School.

D. COLE FRATES

D. Cole Frates has identified, financed and managed numerous water and power projects across the western United States. Mr. Frates served as president of Samda Inc. from 1995 to 1999 where he was responsible for development water projects throughout California and the western United States as well as Argentina, Cyprus, and Saudi Arabia. In 1999, Mr. Frates sold Samda Inc. to Azurix Corporation, where he worked as vice president until 2001. Mr. Frates was responsible for investing tens of millions of dollars in projects throughout the West. He has evaluated hundreds of projects and

negotiated millions of dollars in long-term water-purchase and storage contracts with land developers, municipalities, and governments, including California municipalities such as the Los Angeles Department of Water and Power.

Mr. Frates began his professional career with U.S. Senator David L. Boren. He graduated Phi Beta Kappa from the University of Tulsa with a bachelor of arts degree in classics, holds a master of arts degree in European studies and international economics from the Johns Hopkins School of Advanced International Studies, and attended Cambridge University, England.

> *WDS* is highly connected within the water transfer and banking community. WDS provides quiet access to the players, templates and lessons from a variety of past efforts. This access saves time, money and ensures that good projects are not damaged by political, regulatory, financial or technical missteps.

DAVE DORRANCE

Dave Dorrance is a hydrogeological engineer with 20 years of experience in aquifer storage, groundwater supply, hydrology, agricultural conservation, permitting, water rights, design, construction, O&M, remediation and management. Mr. Dorrance has performed numerous water rights transactions and groundwater projects in every western state. He has performed a variety of municipal, industrial, and power projects throughout the United States and South America, where he managed several thousand wells, reservoirs and more than 400 miles of aqueducts in a region the size of Massachusetts.

Mr. Dorrance earned a bachelor of science degree in geological engineering from the Colorado School of Mines and a master of science degree in hydrology and water resources from the University of Arizona.

CHARLES STRINGER

Charles Stringer is a licensed attorney with 15 years' experience in commercial, environmental, natural resources, and American Indian law and policy. Mr. Stringer joined the Environmental Protection Agency in 1991, where he assumed responsibility for multimillion dollar hazardous waste and natural resource damages cases. He helped spearhead the development of the agency's emerging regulations and policies on the relationship between American Indian treaty rights and environmental laws, including new laws affecting tribal water resources. Mr. Stringer followed his interest in the nexus between sustainable resource development and state, federal and tribal prerogatives to the 1.6 million acre White Mountain Apache reservation, where he served as the tribe's senior attorney on environmental and natural resource matters. He then served the Northwest Indian Fisheries Commission as a senior policy advisor to twenty tribes surrounding the Puget Sound. Mr. Stringer brings extensive experience in water resources, endangered species, energy development, and cultural resources, as well as commercial transactions and bond financing.

Mr. Stringer's honors and awards are many, including appointment by EPA Administrator Carol Browner to the Federal Advisory Committee on Environmental Justice, and the prestigious Certificate of Commendation from the U.S. Department of Justice. He has a law degree from the University of Minnesota, where he graduated with honors, and a master's degree in public administration from Harvard University.

ANDREW WERNER

Mr. Werner has more than ten years' experience in water resource investments and management. In 1994, he began his water industry career in Tacoma, WA, as a hydrogeologist at Robinson & Noble, Inc., where he developed a scientific understanding of ground and surface water dynamics. Mr. Werner went on to become chief water analyst at Global Resource Investments, a brokerage firm specializing in natural resource investments. In 1999, he cofounded the company Group Triton, an advisory firm specializing in water investments.

Mr. Werner has a bachelor of science degree in geology and a master of science degree in geochemistry from Virginia Polytechnic Institute and State University. Previous to his career in water, Mr. Werner conducted research at Los Alamos National Laboratory where he studied the mechanisms for asbestos induced-diseases. His findings are published in *American Mineralogist*.

ARI SWILLER

Before joining WDS, Ari Swiller was a principal in The Yucaipa Companies, a private equity firm based in Los Angeles with more than one billion dollars under management. Mr. Swiller's responsibilities included raising Yucaipa's private equity funds, strategic investment planning, public relations, community affairs, and philanthropy. In addition, Mr. Swiller managed the firm's board of advisors, which includes former President Bill Clinton and former HUD Secretary Henry Cisneros.

Mr. Swiller is a board member of D.A.R.E. America, the Chrysalis Foundation, the Los Angeles Conservation Corps., and the L.A. Urban League Capital Campaign. Mr. Swiller received a bachelor's degree from Cornell University.

DOUGLAS BOXER, ESQ.

Mr. Boxer has more than 20 years' experience in politics and government. Mr. Boxer, a lawyer, began his career with the San Francisco firm of Hanson, Bridgett, Marcus, Vlahos and Rudy. He left the law firm to work in government, serving for three years in Washington, D.C. at two cabinet-level departments of the executive branch. He continued his government service in the Los Angeles Mayor's office as director of intergovernmental affairs for the City of Los Angeles.

On leaving government service, Mr. Boxer successfully founded and launched his own political consultancy firm focused on government relations, communications and public affairs. Clients included Samda Water Development, Inc., The Walt Disney Company, Ralph's Grocery Company, and financial services firm Chambers, Dunhill and Rubin. Mr. Boxer also produced the official site for Senator Barbara Boxer's re-election campaign, which received the George Washington Graduate School of Political Management's Golden Dot Award's Grand Prize for the 1998 best overall political Web site.

Mr. Boxer received his bachelor of arts degree in international political economy from University of California, Berkeley and his law degree from the University of San Francisco School of Law, where he graduated cum laude.

DON A. WRIGHT

Don Wright brings seventeen years of journalism experience to his position with WDS. Reporting on a wide range of topics and beats, Mr Wright's award winning articles and photographs have appeared in local and national publications such as *Range Magazine*, and the *Los Angeles Times*. His diverse

stories include coverage of the Peterson murder trial, interviews with California Secretary of State Bill Jones, comedians/author Ben Stein, musicians Wayland Jennings and Nick Fleetwood, and in-depth looks at the economic impacts to agriculture of the Klamath Basin water cutoff and closing the San Luis drain on the San Joaquin Valley's West Side.

Mr. Wright was Assistant to the Fresno County Board of Supervisors, Housing Commissioner of the Fresno County Housing Authority, and past Secretary of the Central Valley Chapter of California Women for Agriculture. He has been involved in numerous city, county and state political campaigns and was publisher/editor of his own newspaper for three years.

A graduate of California State University, Fresno, with a BA in Speech Communication, Mr. Wright is currently working as a freelance journalist and as consultant to WDS for the past two years. He covers various meetings and seminars to keep WDS clients current on water conditions in California's $30 Billion agricultural economy.

JAMES COSTA – Ex-Officio

James Costa was a California State Senator from 1994-2001 and an Assembly member from 1978-1994 representing central California. He served as President of the National Conference of State Legislatures from 2000-2001. During his tenure in the Assembly and Senate, Mr. Costa served as Chair of the Water, Parks, and Wildlife Committee and the Ways and Means Subcommittee on Resources. From the time of his election to the Senate in 1994, he chaired the Agriculture and Water Resources Committee and served as a member of the Banking, Commerce and International Trade Committee, the Housing and Community Development Committee, and the Transportation Committee.

Mr. Costa's major legislative accomplishments include forging the historic agreements that became Proposition 204, The Safe, Clean, Reliable Water Supply Act of 1996; writing the 1998 and 1999 agricultural land conservation laws; authoring a major reform of the Endangered Species Act; creating the San Joaquin River Parkway Conservancy; and leading the effort to save and improve Amtrak passenger rail service in California and to create the California High Speed Rail Commission.

Mr. Costa has been the recipient of numerous awards, including the Kenneth L. Maddy Central Valley Leadership Award.

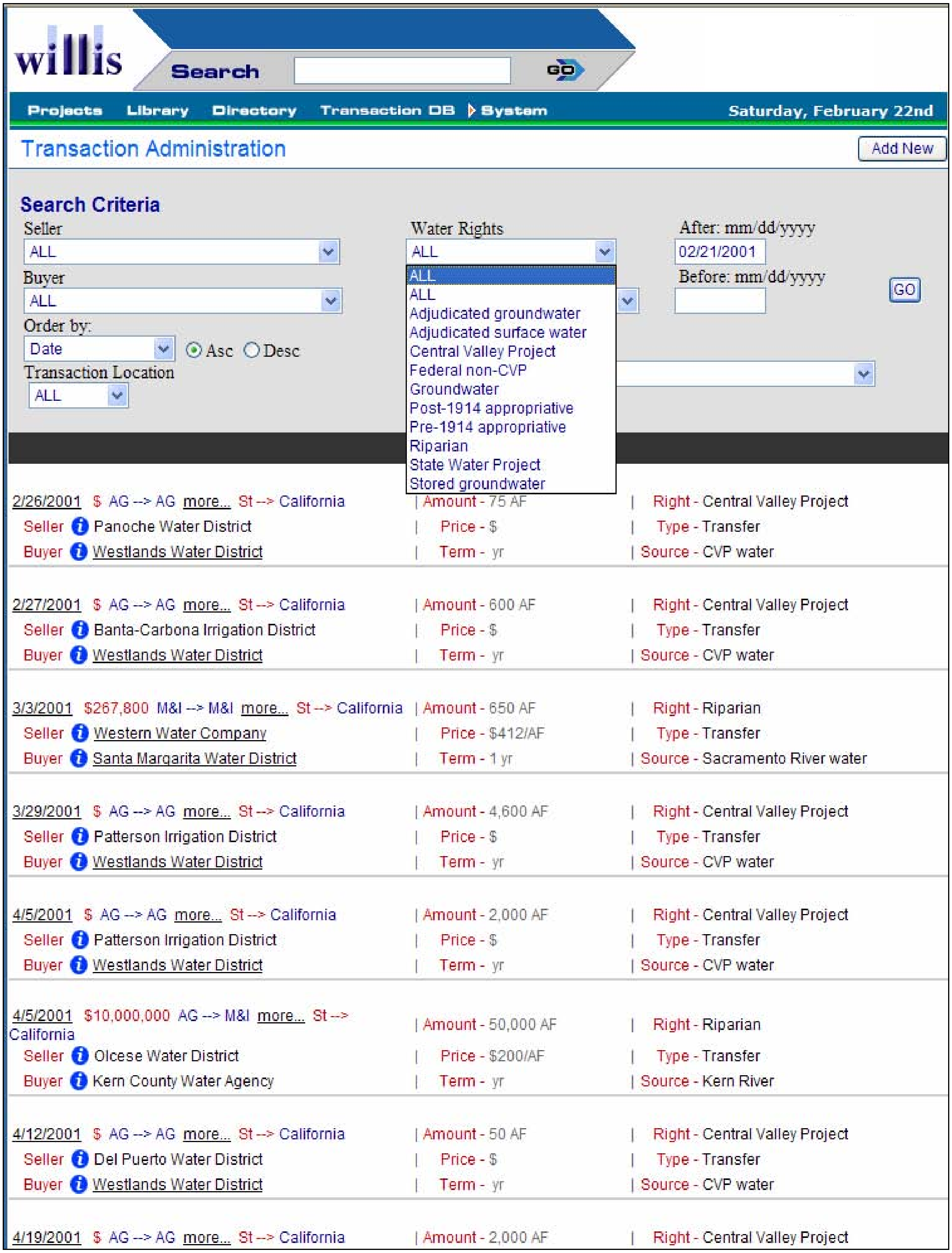
WDS is highly connected within the water transfer and banking community. WDS provides quiet access to the players, templates and lessons from a variety of past efforts. This access saves time, money and ensures that good projects are not damaged by political, regulatory, financial or technical missteps.

Contact Information

Western Development and Storage, LLC
5700 Wilshire Blvd, Suite 330
Los Angeles, CA 90036
(323) 936-9303

Please contact Andrew Werner

WDS Transaction Database



Appendix B
Property Owner Questionnaire

ENVIRONMENTAL SITE ASSESSMENT QUESTIONNAIRE

Introduction: The following questionnaire has been prepared in accordance with "Standard E 1528-00, Standard Practice for Environmental Site Assessments: Transaction Screen Process," adopted by the American Society for Testing and Materials (ASTM, 2000) as part of the Phase 1 Environmental Site Assessment standard process.

Questionnaire:

1a. Is the property used for an industrial use?

Yes No Unknown Comments

1b. Is any adjoining property used for an industrial use?

Yes No Unknown Comments

ENVIRONMENTAL SITE ASSESSMENT QUESTIONNAIRE
(continued)

2a. Do you have any knowledge that the property has been used for an industrial use in the past?

Yes No Unknown Comments

2b. Do you have any knowledge that any adjoining property has been used for an industrial use in the past?

Yes No Unknown Comments = Brograw ~1996 b/w 140th 150th AVE A to AVE B

3a. Is the property used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?

Yes No Unknown Comments

3b. Is any adjoining property used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?

Yes No Unknown Comments

4a. Do you have any knowledge that the property has been used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?

Yes No Unknown Comments

4b. Do you have any knowledge that any adjoining property has been used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility (if applicable, identify which)?

Yes No Unknown Comments

5a. Are there currently any damaged or discarded automotive or industrial batteries, pesticides, paints, or other chemicals in individual containers of >5 gallons (gal.) (19 liters [L]) in volume or 50 gal. (190 L) in the aggregate, stored on or used at the property or at the facility (if applicable, identify which)?

Yes No Unknown Comments

ENVIRONMENTAL SITE ASSESSMENT QUESTIONNAIRE
(continued)

5b. Do you have any knowledge that there have been previously any damaged or discarded automotive or industrial batteries, pesticides, paints, or other chemicals in individual containers of >5 gal. (19 L) in volume or 50 gal. (190 L) in the aggregate, stored on or used at the property or at the facility (if applicable, identify which)?

Yes No Unknown Comments

6a. Are there currently any industrial drums (typically 55 gal. [208 L]) or sacks of chemicals located on the property or at the facility (if applicable, identify which)?

Yes No Unknown Comments

6b. Do you have any knowledge that there have been previously any industrial drums (typically 55 gal. [208 L]) or sacks of chemicals located on the property or at the facility (if applicable, identify which)?

Yes No Unknown Comments

7a. Do you have any knowledge that fill dirt that originated from a contaminated site has been brought onto the property?

Yes No Unknown Comments

7b. Do you have any knowledge that fill dirt of an unknown origin has been brought onto the property?

Yes No Unknown Comments

8a. Are there currently any pits, ponds, or lagoons in connection with waste treatment or waste disposal located on the property (if applicable, identify which)?

Yes No Unknown Comments

8b. Do you have any knowledge that there have been previously any pits, ponds, or lagoons in connection with waste treatment or waste disposal located on the property (if applicable, identify which)?

Yes No Unknown Comments

9a. Is there currently any stained soil on the property?

Yes No Unknown Comments

ENVIRONMENTAL SITE ASSESSMENT QUESTIONNAIRE
(continued)

9b. Do you have any knowledge that there has been previously any stained soil on the property?

Yes No Unknown Comments

10a. Are there currently any registered or unregistered storage tanks (above or underground) located on the property (if applicable, identify which)?

Yes No Unknown Comments

10b. Do you have any knowledge that there have been previously any registered or unregistered storage tanks (above or underground) located on the property (if applicable, identify which)?

Yes No Unknown Comments

11a. Are there currently any vent pipes, fill pipes, or access ways indicating a fill pipe protruding from the ground on the property or adjacent to any structure located on the property (if applicable, identify which)?

Yes No Unknown Comments

11b. Do you have any knowledge that there have been previously any vent pipes, fill pipes, or access ways indicating a fill pipe protruding from the ground on the property or adjacent to any structure located on the property (if applicable, identify which)?

Yes No Unknown Comments

12a. Is there currently evidence of leaks, spills, or staining by substances other than water, or foul odors associated with any flooring, drains, walls, ceilings, or exposed grounds on the property (if applicable, identify which)?

Yes No Unknown Comments

12b. Do you have any knowledge that there have been previously any leaks, spills, or staining by substances other than water, or foul odors associated with any flooring, drains, walls, ceilings, or exposed grounds on the property (if applicable, identify which)?

Yes No Unknown Comments

ENVIRONMENTAL SITE ASSESSMENT QUESTIONNAIRE
(continued)

13a. If the property is served by a private well or non-public water system, is there evidence or do you have knowledge that contaminants have been identified in the well or system that exceed guidelines applicable to the water system?

Yes No Unknown Comments

13b. If the property is served by a private well or non-public water system, is there evidence or do you have knowledge that the well has been designated by any government environmental/health agency as being contaminated?

Yes No Unknown Comments

14. Do you have any knowledge of environmental liens or government notification relating to past or recurrent violations of environmental laws with respect to the property or any facility located on the property?

Yes No Unknown Comments

15a. Have you been informed of the past existence of hazardous substances or petroleum products with respect to the property or any facility located on the property?

Yes No Unknown Comments

15b. Have you been informed of the current existence of hazardous substances or petroleum products with respect to the property or any facility located on the property?

Yes No Unknown Comments

15c. Have you been informed of the past existence of environmental violations with respect to the property or any facility located on the property?

Yes No Unknown Comments

15d. Have you been informed of the current existence of environmental violations with respect to the property or any facility located on the property?

Yes No Unknown Comments

16. Do you have any knowledge of any environmental assessment of the property or facility that indicated the presence of hazardous substances or petroleum products on, or contamination of, the property or recommended further assessment of the property?

Yes No Unknown Comments

ENVIRONMENTAL SITE ASSESSMENT QUESTIONNAIRE
(continued)

17. Do you know of any past, threatened, or pending lawsuits or administrative proceedings concerning a release or threatened release of any hazardous substance or petroleum products involving the property by any owner or occupant of the property?

Yes No Unknown Comments

18a. Does the property discharge wastewater (not including sanitary waste or storm water) onto or adjacent to the property and/or into a storm water system?

Yes No Unknown Comments

18b. Does the property discharge wastewater (not including sanitary waste or storm water) onto or adjacent to the property and/or into a sanitary sewer system?

Yes No Unknown Comments

19. Do you have any knowledge that any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries, or any other waste materials have been dumped above grade, buried and/or burned on the property (if applicable, identify which)?

Yes No Unknown Comments

20. Is there a transformer, capacitor, or any hydraulic equipment for which there are any records indicating the presence of PCBs (if applicable, identify which)?

Yes No Unknown Comments

This Questionnaire Was Completed by:

Name (Print) Craig Van Dam

Signature

Title

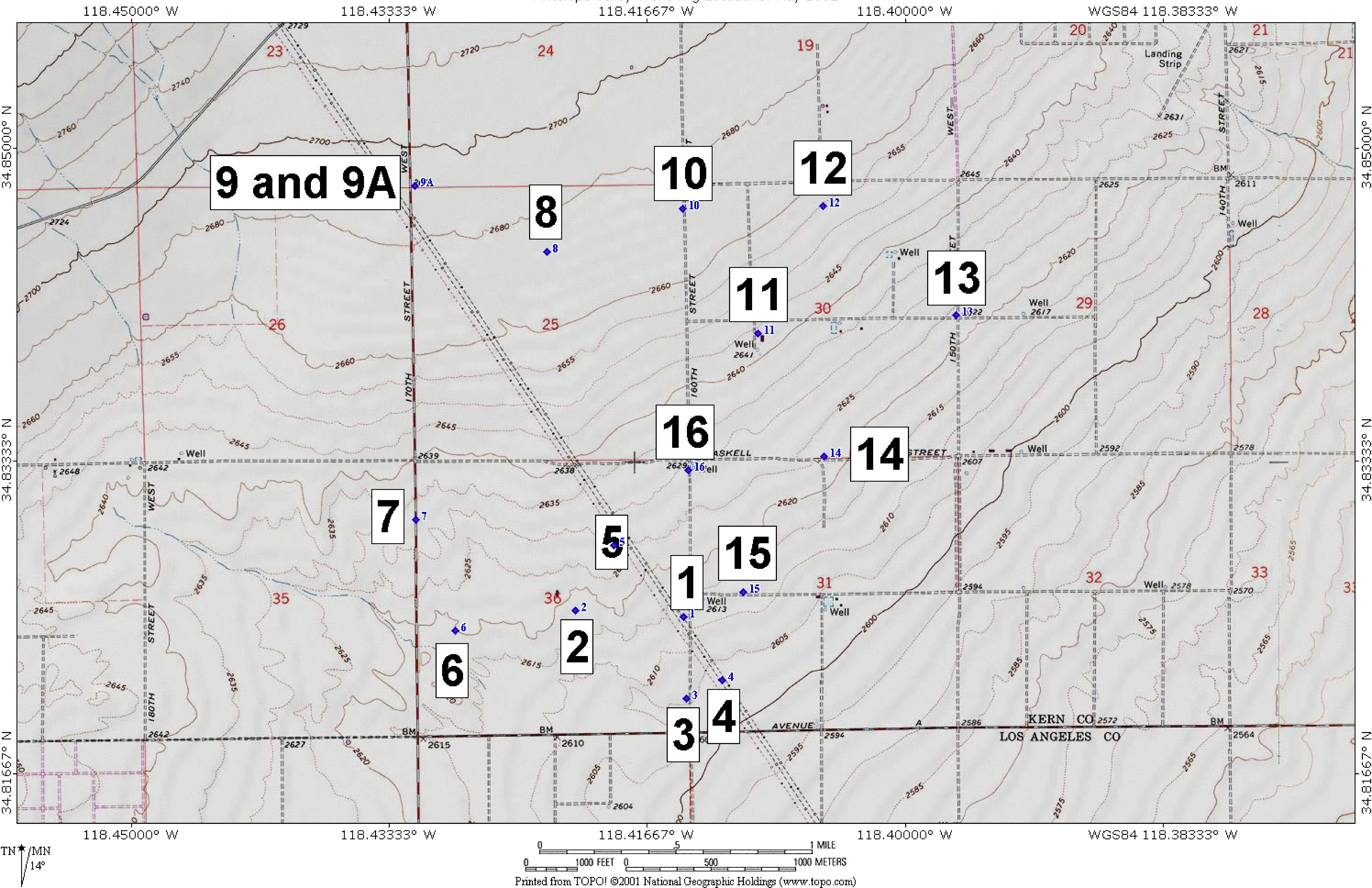
Representing Van Dam Farms

Address 9753 East Ave, F-8

City, State, Zip Lancaster CA 93535

Appendix C
Trench Investigation Results

Antelope Valley Trenching Locations: May 2002



Trench	Soil Type	Name	Unified	Max Dry Density (lb/ft3)	Bulk Density	Passing No. 4	Passing No. 10	Passing No. 40	Passing No. 200	Passing 0.002 mm	Liquid Limit	Plasticity Index	K (inches/hr)	Salinity (mmhos/cm)	Corrosivity	Sanitary Absorption (ft2/1000-gal)	Hydrologic Group	Suitability For Berms	Low inches/hr	High inches/hr	Avg ft/dy	Min ft/dy	Max ft/dy
1	Rm	Rosamond loamy fine sand	SM	118	1.5	95-100%	90-95%	50-75%	15-30%	16%		Non-plastic	2-6.3	0-2	Moderate	25	Slow infiltration	Moderate to low stability	2	6.3	8.3	4	12.6
2	Rp	Rosamond loam	SM	118	1.5	95-100%	95-100%	60-85%	25-40%	16%	0-5	0-5	0.63-2	0-2	Low	40	Slow infiltration	Moderate to low stability	0.63	2	2.63	1.26	4
3	Rm-Ro	Rosamond loamy fine sand/Rosamond fine sandy loam	SM	118	1.5	95-100%	90-100%	50-85%	15-40%	16%	0-5	0-5	0.63-6.3	0-2	Low-Mod	25-40	Slow infiltration	Moderate to low stability	0.63	6.3	6.93	1.26	12.6
4	Ro-Rm	Rosamond fine sandy loam/Rosamond loamy fine sand	SM	118	1.5	95-100%	90-100%	50-85%	15-40%	16%	0-5	0-5	0.63-6.3	0-2	Low-Mod	25-40	Slow infiltration	Moderate to low stability	0.63	6.3	6.93	1.26	12.6
5	Ro-Rm	Rosamond fine sandy loam/Rosamond loamy fine sand	SM	118	1.5	95-100%	90-100%	50-85%	15-40%	16%	0-5	0-5	0.63-6.3	0-2	Low-Mod	25-40	Slow infiltration	Moderate to low stability	0.63	6.3	6.93	1.26	12.6
6	HkA	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
7	HkA	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
8	HkB	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
9	HkB	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
9A	HkB	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
10	HgA	Hesperia loamy fine sand	SM	123		95-100%	95-100%	60-80%	15-25%	3%		Non-plastic	6.3-20	0-2	Low	25	Moderate infiltration	Moderate stability	6.3	20	26.3	12.6	40
11	HkA	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
12	HgA	Hesperia loamy fine sand	SM	123		95-100%	95-100%	60-80%	15-25%	3%		Non-plastic	6.3-20	0-2	Low	25	Moderate infiltration	Moderate stability	6.3	20	26.3	12.6	40
13	Ro	Rosamond fine sandy loam	SM	118	1.5	95-100%	95-100%	60-85%	25-40%	16%	0-5	0-5	0.63-2	0-2	Low	40	Slow infiltration	Moderate to low stability	0.63	2	2.63	1.26	4
14	HkA	Hesperia fine sandy loam	SM	123		95-100%	95-100%	75-85%	25-35%	3%		Non-plastic	2-6.3	0-2	Low	40	Moderate infiltration	Moderate stability	2	6.3	8.3	4	12.6
15	Ro	Rosamond fine sandy loam	SM	118	1.5	95-100%	95-100%	60-85%	25-40%	16%	0-5	0-5	0.63-2	0-2	Low	40	Slow infiltration	Moderate to low stability	0.63	2	2.63	1.26	4
16	Rm-Ro	Rosamond loamy fine sand/Rosamond fine sandy loam	SM	118	1.5	95-100%	90-100%	50-85%	15-40%	16%	0-5	0-5	0.63-6.3	0-2	Low-Mod	25-40	Slow infiltration	Moderate to low stability	0.63	6.3	6.93	1.26	12.6

	Infiltration	Soil Survey	Saturated K	Average Coarse/Fine Ratio	Dorrance Unified Interpretation Total	Dorrance Unified Interpretation <6ft	Conclusion
Best	9A	10,12	10	10	11	11	10,11
	13		11	11	12	1,4,10,14,16	12,13
	10		13	13	10	7,9,12	9,9A
	6	1,6,7,8,9A,11,14	9	9	9	2,5,9A	1,2,3,4,5,6,7,8,14,15,16
	8		12	12	9A	13	
	4,15		9A	9A	13	6,15	
	2,5,16	2,3,4,5,13,15,16	2	2	15	3	
	1		7	7	14	8	
	3		4	6	16		
	7		6	4	4		
	14		14	14	6		
			5	5	7		
			15	15	3		
			3	3	2		
			1	16	1		
Worst			16	8	5		
			8	1	8		
Indeterminate	11,12						
Priority in Conclusions	**1**	**6**	**2**	**4**	**3**	**5**	

Unified Visual-Manual Classifications

Depth (ft)	1	2	3	4	5	6	7	8	9	9A	10	11	12	13	14	15	16
0	SM	SM	ML	SM	SM	SC	GM	SC	GM	GM	SM	SP	SW	SM	SM	ML	ML
1																	
2																	
3	SM	SM	SM-SC	SM	SM	SM	SM	SC	SM	SM-SC	SP	SW	SC	SM	SM	SM	ML
4													GM				
5	SM																SM
6		SM-SC	SM	SM	SP	SM	SM	SM	SC	SM	SP	SW	SM	SM	SM	SM	
7																	
8	SM																GM
9	ML	SW		SM	SP	SM	SM	SM	GP	GP	SP	SW	SW	GM	SW	ML	
10			SM			GM											
11	SM					GM			GP							GW	SM
12		ML	SP	SC	SP		SC	SC		GP	SP	SM	SW	GM	GC	GW	
13															ML		
14		ML	SM														
15	GM																
16																	

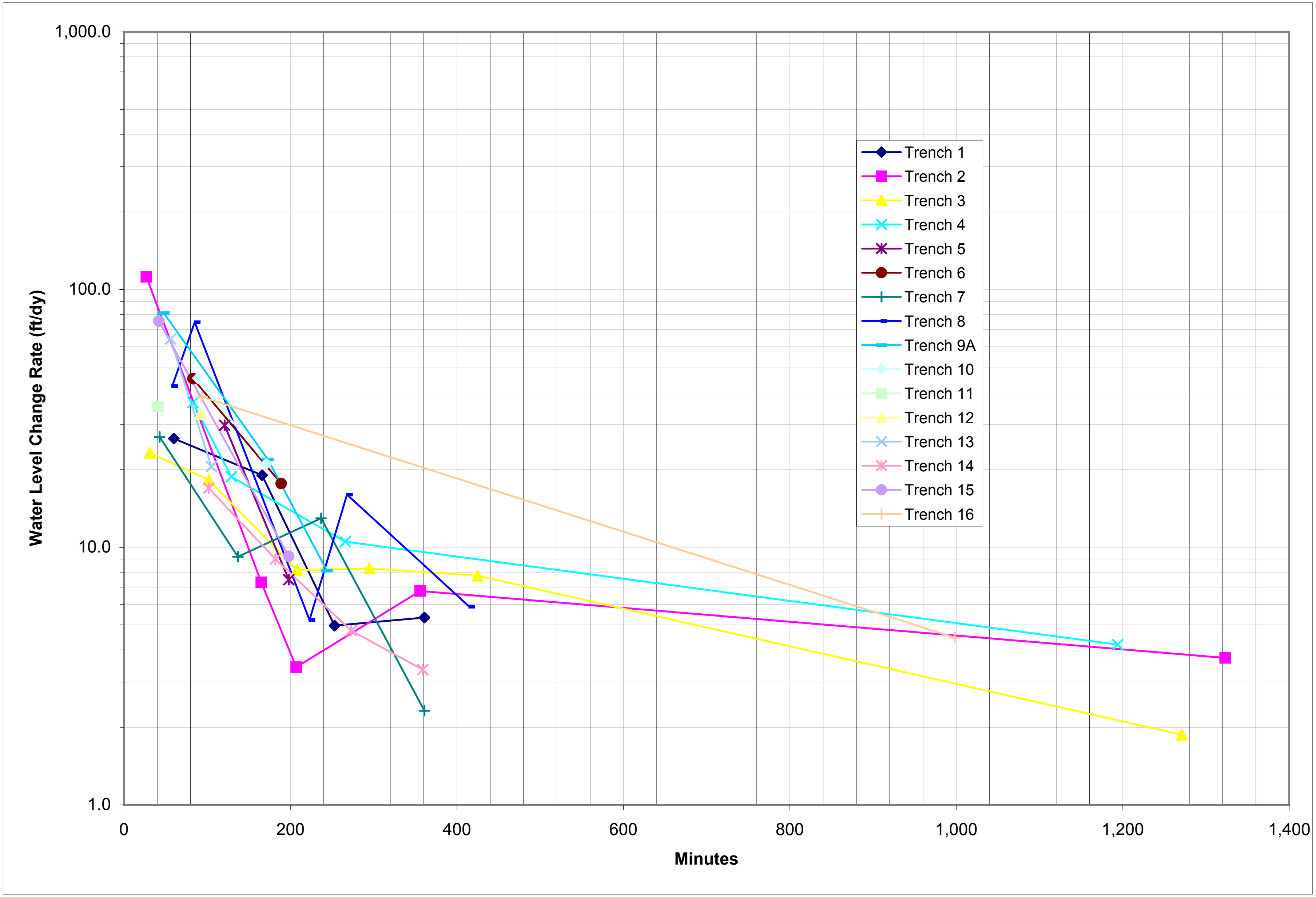
Dorrance Classification **1=Sand & gravel 2=Contains silt 3=Contains clay**

Depth (ft)	1	2	3	4	5	6	7	8	9	9A	10	11	12	13	14	15	16
0	2	2	3	2	2	3	1	3	1	2	2	1	2	2	2	3	2
1																	
2																	
3	2	2	3	2	2	2	2	3	2	2	2	1	3	3	2	2	2
4													1				
5	2																2
6		3	2	2	3	3	3	3	3	3	2	1	2	2	2	3	
7																	
8	3																2
9	3	1		2	3	2	2	3	1	1	2	1	1	2	1	1	
10			2			1											
11	3					1			1							1	3
12		3	2	3	3		3	3		1	2	2	1	1	3	1	
13															3		
14		3	2														
15	2																
16																	
Average	2	2	2	2	3	2	2	3	2	2	2	1	2	2	2	2	2

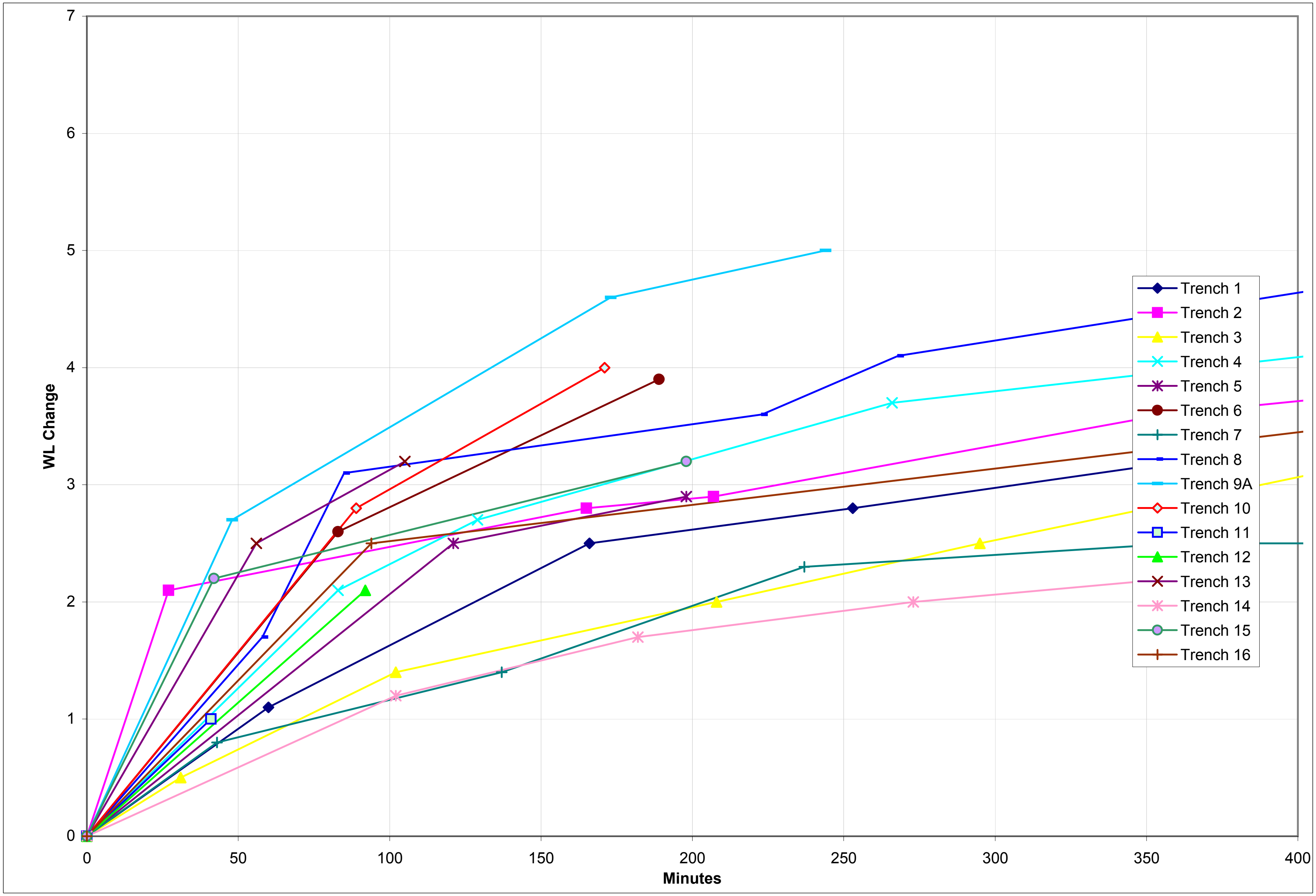
Estimation of K and other parameters from seive data using the US Salinity Laboratory Software: Rosetta

Trench	Depth (ft)	Input Code Code	Input Comment Comment	Input Sand% Measured	Input Silt% Measured	Input Clay% Estimated	Input gm/cm3 NA	Input Theta33 NA	Input Theta1500 NA	Code	Description	Residual Water content Theta_r cm3/cm3	Saturated Water Content Theta_s cm3/cm3	Curve match Alpha log(1/cm)	Curve match N Log10	Saturated K Ks L(cm/day)	van Genuchten-Mualem match point at saturation Ko L(cm/day)	Tortuosity connectivity L NA	Specific Yield Specific Yield Sy	K (ft/dy)	Kmin(ft/dy)
1	3	1	1-3ft	71	15	15	-9.9	-9.9	-9.9	1	1-3ft	0.0516	0.38212	0.03269	1.39998	34.23799	15.5262	-1.26369	33%	1.1	0.5
2	3	2	2-3ft	80	10	10	-9.9	-9.9	-9.9	2	2-3ft	0.04878	0.37858	0.03448	1.61671	77.6804	20.99656	-0.97698	33%	2.5	0.7
3	3	3	3-3ft	84	13	3	-9.9	-9.9	-9.9	3	3-3ft	0.03937	0.38737	0.04272	1.98001	155.6361	40.17677	-0.83709	35%	5.1	1.3
4	3	4	4-3ft	82	9	9	-9.9	-9.9	-9.9	4	4-3ft	0.049	0.37829	0.0344	1.7156	97.72842	22.15605	-0.92302	33%	3.2	0.7
5	3	5	5-3ft	80	10	10	-9.9	-9.9	-9.9	5	5-3ft	0.04878	0.37858	0.03448	1.61671	77.6804	20.99656	-0.97698	33%	2.5	0.7
6	3	6	6-3ft	86	11	3	-9.9	-9.9	-9.9	6	6-3ft	0.04175	0.38554	0.04088	2.15346	196.8554	36.6938	-0.8298	34%	6.5	1.2
7	3	7	7-3ft	91	6	3	-9.9	-9.9	-9.9	7	7-3ft	0.04831	0.38028	0.03587	2.73924	402.7625	26.17327	-0.86959	33%	13.2	0.9
8	3	8	8-3ft	69	16	16	-9.9	-9.9	-9.9	8	8-3ft	0.05281	0.38291	0.03171	1.38267	30.20041	14.42	-1.30223	33%	1.0	0.5
9	3	9	9-3ft	93	4	3	-9.9	-9.9	-9.9	9	9-3ft	0.05097	0.37787	0.03399	3.02593	544.5021	23.26307	-0.89794	33%	17.9	0.8
9A	3	10	9A-3ft	79	11	11	-9.9	-9.9	-9.9	10	9A-3ft	0.04909	0.38035	0.03484	1.5609	64.98079	20.4664	-1.02524	33%	2.1	0.7
10	3	11	10-3ft	94	3	3	-9.9	-9.9	-9.9	11	10-3ft	0.05227	0.37659	0.0331	3.17691	629.2412	22.27499	-0.90963	32%	20.6	0.7
11	3	12	11-3ft	93	4	3	-9.9	-9.9	-9.9	12	11-3ft	0.05097	0.37787	0.03399	3.02593	544.5021	23.26307	-0.89794	33%	17.9	0.8
12	3	13	12-3ft	78	11	11	-9.9	-9.9	-9.9	13	12-3ft	0.04884	0.37885	0.03437	1.54286	63.28647	19.7049	-1.03781	33%	2.1	0.6
13	3	14	13-3ft	83	8	8	-9.9	-9.9	-9.9	14	13-3ft	0.04907	0.3767	0.03391	1.80919	120.7559	22.42154	-0.88693	33%	4.0	0.7
14	3	15	14-3ft	70	15	15	-9.9	-9.9	-9.9	15	14-3ft	0.05172	0.38057	0.03186	1.3957	33.77414	14.8109	-1.2641	33%	1.1	0.5
15	3	16	15-3ft	75	12	12	-9.9	-9.9	-9.9	16	15-3ft	0.04912	0.3777	0.03341	1.47736	51.70694	17.66215	-1.11006	33%	1.7	0.6
16	3	17	16-3ft	67	16	16	-9.9	-9.9	-9.9	17	16-3ft	0.05324	0.37996	0.02993	1.37867	29.4818	13.07316	-1.28794	33%	1.0	0.4
1	5	18	1-5ft	83	9	9	-9.9	-9.9	-9.9	18	1-5ft	0.04945	0.37971	0.03469	1.7484	101.6421	22.78308	-0.91336	33%	3.3	0.7
2	6	19	2-6ft	75	12	12	-9.9	-9.9	-9.9	19	2-6ft	0.04912	0.3777	0.03341	1.47736	51.70694	17.66215	-1.11006	33%	1.7	0.6
3	6	20	3-6ft	64	18	18	-9.9	-9.9	-9.9	20	3-6ft	0.05599	0.38369	0.02851	1.36192	23.60007	11.75584	-1.32359	33%	0.8	0.4
4	6	21	4-6ft	77	12	12	-9.9	-9.9	-9.9	21	4-6ft	0.04932	0.38067	0.03462	1.50108	53.86363	19.17245	-1.08964	33%	1.8	0.6
5	6	22	5-6ft	85	12	3	-9.9	-9.9	-9.9	22	5-6ft	0.04053	0.38647	0.04183	2.06239	174.2599	38.59783	-0.83191	35%	5.7	1.3
6	6	23	6-6ft	82	9	9	-9.9	-9.9	-9.9	23	6-6ft	0.049	0.37829	0.0344	1.7156	97.72842	22.15605	-0.92302	33%	3.2	0.7
7	6	24	7-6ft	76	12	12	-9.9	-9.9	-9.9	24	7-6ft	0.04917	0.37914	0.03404	1.48799	52.71264	18.40724	-1.10128	33%	1.7	0.6
8	6	25	8-6ft	63	18	18	-9.9	-9.9	-9.9	25	8-6ft	0.05633	0.38233	0.02758	1.36257	23.31044	11.16183	-1.30459	33%	0.8	0.4
9	6	26	9-6ft	70	15	15	-9.9	-9.9	-9.9	26	9-6ft	0.05172	0.38057	0.03186	1.3957	33.77414	14.8109	-1.2641	33%	1.1	0.5
9A	6	27	9A-6ft	82	9	9	-9.9	-9.9	-9.9	27	9A-6ft	0.049	0.37829	0.0344	1.7156	97.72842	22.15605	-0.92302	33%	3.2	0.7
10	6	28	10-6ft	97	3	0	-9.9	-9.9	-9.9	28	10-6ft	0.04812	0.38115	0.03665	3.88789	996.7562	36.53282	-0.87944	33%	32.7	1.2
11	6	29	11-6ft	93	4	3	-9.9	-9.9	-9.9	29	11-6ft	0.05097	0.37787	0.03399	3.02593	544.5021	23.26307	-0.89794	33%	17.9	0.8
12	6	30	12-6ft	81	10	10	-9.9	-9.9	-9.9	30	12-6ft	0.04913	0.38004	0.03486	1.64121	80.23166	21.72328	-0.96505	33%	2.6	0.7
13	6	31	13-6ft	90	7	3	-9.9	-9.9	-9.9	31	13-6ft	0.04697	0.38141	0.03686	2.60568	345.8523	28.0477	-0.85584	33%	11.3	0.9
14	6	32	14-6ft	84	13	3	-9.9	-9.9	-9.9	32	14-6ft	0.03937	0.38737	0.04272	1.98001	155.6361	40.17677	-0.83709	35%	5.1	1.3
15	6	33	15-6ft	85	12	3	-9.9	-9.9	-9.9	33	15-6ft	0.04053	0.38647	0.04183	2.06239	174.2599	38.59783	-0.83191	35%	5.7	1.3
16	5	34	16-5ft	80	10	10	-9.9	-9.9	-9.9	34	16-5ft	0.04878	0.37858	0.03448	1.61671	77.6804	20.99656	-0.97698	33%	2.5	0.7
1	9	35	1-9ft	45	27	27	-9.9	-9.9	-9.9	35	1-9ft	0.07239	0.40629	0.01761	1.37282	7.88035	5.35416	-0.99755	33%	0.3	0.2
2	9	36	2-9ft	93	4	3	-9.9	-9.9	-9.9	36	2-9ft	0.05097	0.37787	0.03399	3.02593	544.5021	23.26307	-0.89794	33%	17.9	0.8
3	9	37	3-9ft	77	12	12	-9.9	-9.9	-9.9	37	3-9ft	0.04932	0.38067	0.03462	1.50108	53.86363	19.17245	-1.08964	33%	1.8	0.6
4	9	38	4-9ft	87	10	3	-9.9	-9.9	-9.9	38	4-9ft	0.04301	0.38456	0.03989	2.2534	224.2842	34.56518	-0.83108	34%	7.4	1.1
5	9	39	5-9ft	73	14	14	-9.9	-9.9	-9.9	39	5-9ft	0.0506	0.38151	0.03352	1.42396	39.22465	16.68891	-1.21321	33%	1.3	0.5
6	9	40	6-9ft	78	11	11	-9.9	-9.9	-9.9	40	6-9ft	0.04884	0.37885	0.03437	1.54286	63.28647	19.7049	-1.03781	33%	2.1	0.6
7	9	41	7-9ft	80	10	10	-9.9	-9.9	-9.9	41	7-9ft	0.04878	0.37858	0.03448	1.61671	77.6804	20.99656	-0.97698	33%	2.5	0.7
8	9	42	8-9ft	76	12	12	-9.9	-9.9	-9.9	42	8-9ft	0.04917	0.37914	0.03404	1.48799	52.71264	18.40724	-1.10128	33%	1.7	0.6
9	9	43	9-9ft	96	3	1	-9.9	-9.9	-9.9	43	9-9ft	0.0496	0.37944	0.03535	3.64278	865.4548	30.22241	-0.89585	33%	28.4	1.0
9A	9	44	9A-9ft	93	4	3	-9.9	-9.9	-9.9	44	9A-9ft	0.05097	0.37787	0.03399	3.02593	544.5021	23.26307	-0.89794	33%	17.9	0.8
10	9	45	10-9ft	94	3	3	-9.9	-9.9	-9.9	45	10-9ft	0.05227	0.37659	0.0331	3.17691	629.2412	22.27499	-0.90963	32%	20.6	0.7
11	9	46	11-9ft	95	3	2	-9.9	-9.9	-9.9	46	11-9ft	0.05099	0.37793	0.03417	3.40515	742.6774	25.59489	-0.90622	33%	24.4	0.8
12	9	47	12-9ft	97	3	0	-9.9	-9.9	-9.9	47	12-9ft	0.04812	0.38115	0.03665	3.88789	996.7562	36.53282	-0.87944	33%	32.7	1.2
13	9	48	13-9ft	98	2	0	-9.9	-9.9	-9.9	48	13-9ft	0.04907	0.3797	0.03589	4.06206	1128.921	37.32853	-0.87618	33%	37.0	1.2
14	9	49	14-9ft	84	8	8	-9.9	-9.9	-9.9	49	14-9ft	0.04947	0.37797	0.03417	1.84679	126.311	22.93313	-0.88042	33%	4.1	0.8
15	9	50	15-9ft	76	12	12	-9.9	-9.9	-9.9	50	15-9ft	0.04917	0.37914	0.03404	1.48799	52.71264	18.40724	-1.10128	33%	1.7	0.6
16	8	51	16-8ft	68	16	16	-9.9	-9.9	-9.9	51	16-8ft	0.05299	0.38138	0.03082	1.38007	29.80934	13.73174	-1.29731	33%	1.0	0.5

Trench	Average Sy	Average K (ft/dy)	Average Kmin (ft/dy)	1/10 Average K (ft/dy)
10	33%	24.7	0.9	2.5
11	33%	20.0	0.8	2.0
13	33%	17.4	1.0	1.7
9	33%	15.8	0.7	1.6
12	33%	12.5	0.9	1.2
9A	33%	7.7	0.7	0.8
2	33%	7.4	0.7	0.7
7	33%	5.8	0.7	0.6
4	33%	4.1	0.8	0.4
6	33%	3.9	0.9	0.4
14	34%	3.5	0.9	0.3
5	34%	3.2	0.8	0.3
15	33%	3.0	0.8	0.3
3	34%	2.5	0.8	0.3
1	33%	1.6	0.5	0.2
16	33%	1.5	0.5	0.1
8	33%	1.2	0.5	0.1



Water Level Change Rate (ft/dy)
1,000.0
100.0
10.0
1.0
0
200
400
600
800
1,000
1,200
1,400
Minutes
Trench 1
Trench 2
Trench 3
Trench 4
Trench 5
Trench 6
Trench 7
Trench 8
Trench 9A
Trench 10
Trench 11
Trench 12
Trench 13
Trench 14
Trench 15
Trench 16



WL Change
Minutes
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300
350
400
Trench 1
Trench 2
Trench 3
Trench 4
Trench 5
Trench 6
Trench 7
Trench 8
Trench 9A
Trench 10
Trench 11
Trench 12
Trench 13
Trench 14
Trench 15
Trench 16

Water Level Change (ft)

Minutes	Trench 1	Minutes	Trench 2	Minutes	Trench 3	Minutes	Trench 4	Minutes	Trench 5	Minutes	Trench 6	Minutes	Trench 7	Minutes	Trench 8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	1.1	27	2.1	31	0.5	83	2.1	121	2.5	83	2.6	43	0.8	58	1.7
166	2.5	165	2.8	102	1.4	129	2.7	198	2.9	189	3.9	137	1.4	85	3.1
253	2.8	207	2.9	208	2	266	3.7					237	2.3	223	3.6
361	3.2	356	3.6	295	2.5	1,194	6.4					361	2.5	268	4.1
		1,323	6.1	425	3.2							418	2.5	415	4.7
				1,271	4.3										

Minutes	Trench 9A	Minutes	Trench 10	Minutes	Trench 11	Minutes	Trench 12	Minutes	Trench 13	Minutes	Trench 14	Minutes	Trench 15	Minutes	Trench 16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	2.7	89	2.8	41	1	92	2.1	56	2.5	102	1.2	42	2.2	94	2.5
173	4.6	171	4					105	3.2	182	1.7	198	3.2	998	5.3
244	5									273	2				
										359	2.2				

Rate of Water Level Change (ft/day)

Minutes	Trench 1	Minutes	Trench 2	Minutes	Trench 3	Minutes	Trench 4	Minutes	Trench 5	Minutes	Trench 6	Minutes	Trench 7	Minutes	Trench 8
60	26.4	27	112.0	31	23.2	83	36.4	121	29.8	83	45.1	43	26.8	58	42.2
166	19.0	165	7.3	102	18.3	129	18.8	198	7.5	189	17.7	137	9.2	85	74.7
253	5.0	207	3.4	208	8.2	266	10.5					237	13.0	223	5.2
361	5.3	356	6.8	295	8.3	1,194	4.2					361	2.3	268	16.0
		1,323	3.7	425	7.8							418		415	5.9
				1,271	1.9										

Minutes	Trench 9A	Minutes	Trench 10	Minutes	Trench 11	Minutes	Trench 12	Minutes	Trench 13	Minutes	Trench 14	Minutes	Trench 15	Minutes	Trench 16
48	81.0	89	45.3	41	35.1	92	32.9	56	64.3	102	16.9	42	75.4	94	38.3
173	21.9	171	21.1					105	20.6	182	9.0	198	9.2	998	4.5
244	8.1									273	4.7				
										359	3.3				

Depth to Water (ft)

Minutes	Trench 1	Trench 2	Trench 3	Trench 4	Trench 5	Trench 6	Trench 7	Trench 8	Trench 9A	Trench 10	Trench 11	Trench 12	Trench 13	Trench 14	Trench 15	Trench 16
0	5.8	2.1	6.0	2.1	3.4	4.9	3.4	3.7	3.2	4.3	5.1	6.8	5.3	5.1	3.6	1.9
27		4.2														
31			6.5													
41											6.1					
42															5.8	
43							4.2									
48									5.9							
56													7.8			
58								5.4								
60	6.9															
83				4.2		7.5										
85								6.8								
89										7.1						
92												Dry (8.9)				
94																4.4
102			7.4											6.3		
105													8.5			
121					5.9											
129				4.8												
137							4.8									
165		4.9														
166	8.3															
171										8.3						
173									7.8							
182														6.8		
189						8.8										
198					6.3										6.8	
207		5.0														
208			8.0													
223								7.3								
237							5.7									
244									8.2							
253	8.6															
266				5.8												
268								7.8								
273														7.1		
280						Dry (8.9)										
295			8.5													
356		5.7														
359														7.3		
361	9.0						5.9									
415								8.4								
418							5.9									
425			9.2													
926											Dry (7.4)					
954													Dry (9.0)			
998																7.2
1,052										Dry (10.1)						
1,091					Dry (7.4)											
1,128															Dry (7.7)	
1,169									Dry (8.7)							
1,194				8.5												
1,271			10.3													
1,323		8.2														
1,368								Dry (10.5)								

% Passing Seive Size

Trench	Depth (Ft)	4	12	30	40	50	100	140	170	200	Pan	Coarse/Fine		
1	3	100%	97%	87%	78%	70%	49%	39%	33%	29%	0%	2.4		
2	3	99%	98%	77%	66%	58%	37%	28%	24%	20%	0%	4.0		
3	3	99%	94%	72%	61%	52%	31%	23%	19%	16%	0%	5.4		
4	3	100%	98%	86%	74%	64%	41%	29%	24%	18%	0%	4.4		
5	3	100%	97%	85%	72%	63%	39%	31%	26%	20%	1%	4.0		
6	3	100%	95%	74%	59%	48%	26%	19%	16%	14%	0%	6.2		
7	3	99%	93%	74%	58%	47%	24%	16%	12%	9%	0%	9.7		
8	3	100%	100%	95%	88%	80%	56%	43%	36%	31%	0%	2.2		
9	3	94%	84%	60%	47%	38%	18%	11%	9%	7%	0%	12.8		
9A	3	98%	93%	78%	68%	59%	37%	28%	25%	21%	0%	3.7		
10	3	95%	87%	66%	54%	43%	19%	11%	9%	6%	0%	16.1		
11	3	99%	93%	72%	62%	52%	26%	15%	11%	7%	0%	13.9		
12	3	100%	98%	86%	76%	68%	43%	32%	27%	22%	0%	3.6		
13	3	100%	97%	87%	81%	74%	44%	29%	24%	17%	0%	4.9		
14	3	99%	97%	86%	77%	71%	54%	43%	36%	30%	0%	2.4		
15	3	99%	96%	83%	76%	69%	47%	36%	31%	25%	0%	3.1		
16	3	100%	98%	90%	84%	77%	57%	43%	37%	33%	0%	2.1		
1	5	100%	97%	78%	67%	58%	35%	27%	22%	17%	0%	4.8		
2	6	98%	94%	77%	68%	60%	41%	33%	29%	25%	0%	3.0		
3	6	100%	99%	90%	83%	76%	56%	46%	41%	36%	0%	1.8		
4	6	99%	98%	85%	76%	69%	46%	34%	29%	23%	0%	3.3		
5	6	99%	94%	76%	64%	55%	33%	24%	19%	15%	0%	5.7		
6	6	100%	94%	75%	61%	50%	29%	23%	20%	18%	0%	4.7		
7	6	95%	91%	74%	65%	57%	39%	31%	28%	24%	0%	3.1		
8	6	100%	99%	92%	87%	80%	62%	51%	44%	37%	0%	1.7		
9	6	98%	96%	84%	77%	73%	54%	40%	34%	30%	0%	2.3		
9A	6	99%	94%	81%	72%	63%	39%	27%	23%	18%	0%	4.4		
10	6	98%	88%	60%	45%	33%	11%	6%	4%	3%	0%	32.3		
11	6	99%	91%	68%	55%	45%	22%	14%	11%	7%	0%	12.7		
12	6	99%	94%	77%	68%	59%	38%	27%	24%	19%	0%	4.2		
13	6	100%	95%	74%	61%	51%	26%	17%	14%	10%	0%	8.8		
14	6	99%	94%	76%	65%	57%	34%	23%	20%	16%	0%	5.4		
15	6	97%	91%	74%	65%	56%	33%	22%	19%	15%	0%	5.7		
16	5	98%	93%	76%	67%	59%	38%	27%	22%	20%	0%	4.0		
1	9	100%	98%	96%	94%	88%	74%	67%	63%	55%	1%	0.8		
2	9	86%	76%	61%	51%	42%	18%	12%	9%	7%	0%	14.0		
3	9	99%	95%	76%	66%	57%	38%	31%	27%	23%	1%	3.3		
4	9	97%	90%	73%	64%	55%	34%	22%	17%	13%	0%	6.7		
5	9	100%	97%	84%	75%	67%	47%	39%	32%	27%	0%	2.7		
6	9	99%	94%	77%	68%	61%	42%	32%	27%	22%	0%	3.5		
7	9	98%	95%	75%	62%	54%	34%	27%	24%	20%	0%	4.1		
8	9	97%	96%	82%	73%	65%	44%	33%	29%	24%	0%	3.2		
9	9	88%	75%	47%	33%	24%	10%	6%	5%	4%	0%	24.0		
9A	9	87%	73%	51%	42%	35%	19%	13%	10%	7%	0%	12.7		
10	9	99%	96%	81%	69%	57%	26%	13%	10%	6%	0%	14.4		
11	9	97%	90%	65%	51%	41%	18%	9%	7%	5%	0%	17.4		
12	9	98%	88%	58%	42%	31%	10%	6%	4%	3%	0%	37.6		
13	9	85%	67%	38%	26%	18%	6%	4%	3%	2%	0%	51.3		
14	9	99%	96%	81%	71%	64%	40%	27%	21%	16%	0%	5.2		
15	9	100%	98%	78%	67%	60%	43%	34%	29%	24%	0%	3.2		
16	8	98%	95%	86%	81%	76%	60%	47%	41%	32%	0%	2.2		
Type		Gravel	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Fines				
1	Average	100%	97%	87%	80%	72%	53%	44%	39%	34%	1%	2.0	1	Rm
2	Average	95%	89%	72%	62%	53%	32%	24%	20%	17%	0%	4.8	2	Rp
3	Average	99%	96%	80%	70%	61%	41%	33%	29%	25%	0%	3.0	3	Rm-Ro
4	Average	99%	95%	81%	71%	63%	40%	29%	23%	18%	0%	4.5	4	Ro-Rm
5	Average	99%	96%	82%	70%	62%	40%	31%	26%	21%	0%	3.8	5	Ro-Rm
6	Average	99%	95%	75%	63%	53%	32%	24%	21%	18%	0%	4.6	6	HkA
7	Average	98%	93%	74%	62%	53%	32%	25%	21%	18%	0%	4.6	7	HkA
8	Average	99%	98%	90%	82%	75%	54%	42%	36%	31%	0%	2.3	8	HkB
9	Average	93%	85%	64%	53%	45%	28%	19%	16%	14%	0%	6.3	9	HkB
9A	Average	95%	87%	70%	61%	52%	32%	23%	19%	16%	0%	5.4	9A	HkB
10	Average	97%	90%	69%	56%	44%	18%	10%	7%	5%	0%	18.5	10	HgA
11	Average	98%	91%	68%	56%	46%	22%	13%	9%	6%	0%	14.4	11	HkA
12	Average	99%	94%	74%	62%	53%	30%	22%	18%	15%	0%	5.9	12	HgA
13	Average	95%	86%	66%	56%	48%	25%	17%	13%	10%	0%	9.4	13	Ro
14	Average	99%	96%	81%	71%	64%	43%	31%	26%	20%	0%	3.9	14	HkA
15	Average	99%	95%	79%	69%	62%	41%	31%	26%	21%	0%	3.7	15	Ro
16	Average	99%	95%	84%	77%	71%	52%	39%	33%	28%	0%	2.6	16	Rm-Ro

Trench #:	16	**Location:**	VAN DAM FARM
Date Started:	20-May-02	**Total Depth:**	11.5' BGS
Date Completed:	23-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 58.3
Project Number:	27-6830	**Longitude:**	W 118 24' 50.6"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test*** Time	Water Level	Trench Depth
GL	ML	Silty fine sand.	.	**1425**	**1.9' bgs**	**11.4' td**
1				**1559**	**4.4' bgs**	**10.5' td**
2						
3	ML	Silty fine sand.	Moderate effervescence. 10 YR 6/3	**5/22**		
4				**703**	**7.2' bgs**	**7.8' td**
5	SM	Silty fine sand.	Oxidized layer.Slight effervescence 10 YR 5/3	.		
6						
7						
8	GM	Silty gravelly fine sand.	Still oxidized.No effervescence 10 YR5/3	.		
9						
10						
11	SM	Silty fine sand with trace clay.	Moderate effervescence. Less Oxidation than above.10 YR 6/2	.		
12						
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1404, which starts infiltration.**	.		

Trench #:	15	**Location:**	VAN DAM FARM
Date Started:	23-May-02	**Total Depth:**	12' BGS
Date Completed:	24-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 35.0"
Project Number:	27-6830	**Longitude:**	W 118 24' 37.8"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	Lithologic Symbol	FORMATION DESCRIPTION and Comments		Infiltration Test* Time	Water Level	Trench Depth
GL	ML	Clayey fine sand.	Highly cemented.	**1214**	**3.6' bgs**	**11.1' td**
1				**1256**	**5.8' bgs**	**9.7' td**
2				**1532**	**6.8' bgs**	**8.9' td**
3	SM	Silty fine sand with trace coarse sand.	Slight-Moderate effervescence. 10 YR 6/3	**5/24**		
4				**702**	**DRY**	**7.7' td**
5						
6	SM	Silty fine sand with trace gravel and clay.	Slight-Moderate effervescence. 10 YR 5/3	.		
7						
8						
9	ML	Fine sand with trace coarse sand.	No effervescence. 10 YR 6/2	.		
10						
11	GW	Gravelly coarse sand at 11.5'	No effervescence. 10 YR 5/2	.		
12	GW	Material coarsing down.	No effervescence. 10 YR 5/2	.		
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1158, which starts infiltration.**	.		

Trench #:	14	**Location:**	VAN DAM FARM
Date Started:	21-May-02	**Total Depth:**	14' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 00.9"
Project Number:	27-6830	**Longitude:**	W118 24' 19.0"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test* Time**	**Water Level**	**Trench Depth**
GL	SM	Silty fine sand		**816**	**5.1' bgs**	**13.0' td**
1				**958**	**6.3' bgs**	**12.2' td**
2				**1118**	**6.8' bgs**	**12.2' td**
3	SM	Silty fine sand with trace coarse sand.	Slight effervescence. 10 YR 5/2	**1249**	**7.1' bgs**	**11.8' td**
4				**1415**	**7.3' bgs**	**11.8' td**
5						
6	SM	Silty fine sand with trace coarse sand.	Slight effervescence. 10 YR 6/2	.		
7						
8						
9	SW	Medium sand with trace gravel.	No effervescence. 10 YR 4/2	.		
10						
11						
12	GC	Clayey gravelly sand.	Slight effervescence. 10 YR 6/2	.		
13						
14	ML	Clayey silty fine sand.	Slight effervescence. 10 YR 7/2	.		
15						
16						
17						
18						
19						
20			***Start of filling was at 0800, which starts infiltration.**	.		

Trench #:	13	**Location:**	VAN DAM FARM
Date Started:	22-May-02	**Total Depth:**	12' BGS
Date Completed:	24-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 28.1"
Project Number:	27-6830	**Longitude:**	W 118 23' 48.2"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test* Time**	**Water Level**	**Trench Depth**
GL	SM	Silty fine sand.	.	**1446**	**5.3' bgs**	**10.6' td**
1				**1542**	**7.8' bgs**	**9.9' td**
2				**1631**	**8.5' bgs**	**9.4' td**
3	SM	Silty clayey fine sand with trace coarse sand.	Moderate effervescence. 10 YR 6/2	**640**	**DRY**	**9.0' td**
4						
5						
6	SM	Medium grain sand with trace silt and gravel.	Slight effervescence. 10 YR 5/3	.		
7						
8						
9	GM	Gravelly sand with trace fines.	No effervescence. 10 YR 4/3	.		
10						
11						
12	GM	Gravelly sand with trace cobble.	No effervescence. 10 YR 4/3	.		
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1427, which starts infiltration.**	.		

Trench #:	12	**Location:**	VAN DAM FARM
Date Started:	21-May-02	**Total Depth:**	12.5' BGS
Date Completed:	23-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 48.9"
Project Number:	27-6830	**Longitude:**	W 118 24' 19.3
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	Lithologic Symbol	FORMATION DESCRIPTION and Comments		Infiltration Test* Time	Water Level	Trench Depth
GL	SW	Silty medium grain sand.	.	**1113**	**6.8' bgs**	**8.9' td**
1				**1245**	**DRY**	**6.5' td**
2				**Cave-in**		
3	SC	Silty fine sand with trace clay.	Slight effervescence. 10 YR 6/3	.		
4	GM	Cobbly sandy lense ~1 foot thick.	Very slight effervescence. 10 YR 5/3	.		
5						
6	SM	Silty fine sand with trace coarse sand.	Slight-moderate effervescence. 10 YR 5/3	.		
7						
8						
9	SW	Medium grain sand with trace gravel.	Slight effervescence. 10 YR 6/2	.		
10						
11						
12	SW	Medium grain sand with trace gravel.	No effervescence. 10 YR 6/2	.		
13						
14		**Note: Cave-in started during filling of trench with water.**				
15						
16						
17						
18						
19						
20			***Start of filling was at 1058, which starts infiltration.**	.		

Trench #:	11	**Location:**	VAN DAM FARM
Date Started:	21-May-02	**Total Depth:**	12' BGS
Date Completed:	23-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 24.5"
Project Number:	27-6830	**Longitude:**	W 118 24' 34.4"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test* Time**	**Water Level**	**Trench Depth**
GL	SP	Fine sand		**1548**	**5.1' bgs**	**10.2' td**
1				**1629**	**6.1' bgs**	**8.4' td**
2						
3	SW	Medium grain sand with trace gravel.	No effervescence. 10 YR 5/3	5/22		
4				**714**	**DRY**	**7.4' td**
5						
6	SW	Gravelly medium grain sand.	No effervescence. 10 YR 5/3	.		
7						
8						
9	SW	Medium grain sand with trace gravel.	No effervescence. 10 YR 5/3	.		
10						
11						
12	SM	Silty medium grain sand with trace clay and gravel.	No effervescence. 10 YR 5/3	.		
13						
14			***Note: Two Steven's Kangaroo Rats found and released from trench.***			
15						
16						
17						
18						
19						
20			***Start of filling was at 1531, which starts infiltration.**	.		

Trench #:	10	**Location:**	VAN DAM FARM
Date Started:	21-May-02	**Total Depth:**	12.5' BGS
Date Completed:	23-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 48.5"
Project Number:	27-6830	**Longitude:**	W 118 24' 51.9"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	Lithologic Symbol	FORMATION DESCRIPTION and Comments		Infiltration Test* Time	Water Level	Trench Depth
GL	SM	Silty medium grain sand with trace gravel.		**1329**	**4.3' bgs**	**11.6' td**
1				**1458**	**7.1' bgs**	**11.1' td**
2				**1620**	**8.3' bgs**	**10.5' td**
3	SP	Silty medium grain sand with trace gravel.	Moderate effervescence. 10 YR 6/2	.		
4				**701**	**DRY**	**10.1' td**
5						
6	SP	Silty medium grain sand with trace gravel.	Interbedded gravel lense at 6.5'. No effervescence	.		
7				.		
8						
9	SP	Silty fine grain sand with trace gravel.	Slight -moderate effervescence.10 YR 6/2	.		
10						
11						
12	SP	Silty fine grain sand with trace gravel.	Slight effervescence. 10 YR 6/2	.		
13						
14						
15						
16						
17						
18						
19						
20			*** Start of filling was at 1311, which starts infiltration.**	.		

Trench #:	9A	**Location:**	VAN DAM FARM
Date Started:	22-May-02	**Total Depth:**	12' BGS
Date Completed:	23-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 52.8"
Project Number:	27-6830	**Longitude:**	W 118 25' 54.2"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test* Time**	**Water Level**	**Trench Depth**
GL	GM	Silty gravelly fine sand.	.	**1211**	**3.2' bgs**	**11.0' td**
1				**1259**	**5.9' bgs**	**9.1' td**
2				**1504**	**7.8' bgs**	**8.9' td**
3	GM	Silty gravelly fine sand.	Moderate effervescence. 10 YR 5/2	**1615**	**8.2' bgs**	**8.9' td**
4				5/23		
5				**740**	**DRY**	**8.7' td**
6	SM	Silty fine sand with trace clay and gravel.	Moderate to intense effervescence. 10 YR 6/3	.		
7						
8						
9	GP	Gravelly sand.	No effervescence. 10 YR 6/2	.		
10						
11						
12	GP	Gravelly sand.	No effervescence. 10 YR 6/2	.		
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1151, which starts infiltration.**			

Trench #:	9	**Location:**	VAN DAM FARM
Date Started:	22-May-02	**Total Depth:**	11.0' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	70'SW of trench 9A
Project Number:	27-6830	**Longitude:**	
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test***		
				Time	**Water Level**	**Trench Depth**
GL	GM	Gravelly medium grain sand.	.	**N/A. Hole collapsed during filling. Backfilled .**		
1						
2						
3	SM	Silty gravelly medium grain sand.	Slight effervescence. 10 YR 6/2	.		
4						
5						
6	SC	Silty fine sand with trace clay and gravel.	Slight to moderate effervescence. 10 YR 6/3	.		
7						
8						
9	GP	Gravelly coarse grain sand.	No effervescence. 10 YR 6/2	.		
10						
11	GP	Gravelly coarse grain sand.	No effervescence. 10 YR 6/2	.		
12						
13						
14						
15						
16						
17						
18						
19						
20						

Trench #:	8	**Location:**	VAN DAM FARM
Date Started:	23-May-02	**Total Depth:**	12' BGS
Date Completed:	24-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 50' 40.2"
Project Number:	27-6830	**Longitude:**	W 118 25' 23.5"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	Lithologic Symbol	FORMATION DESCRIPTION and Comments		Infiltration Test* Time	Water Level	Trench Depth
GL	SC	Silty clayey sand.	Hard Pack	**847**	**3.7' bgs**	**11.5' td**
1				**945**	**5.4' bgs**	**11.5' td**
2				**1012**	**6.8' bgs**	**11.4' td**
3	SC	Silty clayey fine sand.	Secondary leaching,Slight effervescence. 10 YR 5/2	**1230**	**7.3' bgs**	**11.4' td**
4				**1315**	**7.8' bgs**	**11.3' td**
5				**1542**	**8.4' bgs**	**11.2' td**
6	SM	Silty fine sand with trace clay content.	Slight effervescence. 10 YR 6/2	5/24		
7				**735**	**DRY**	**10.5' td**
8						
9	SM	Silty fine sand with trace clay and trace gravel.	No effervescence.10 YR 6/2	.		
10						
11						
12	SC	Silty clayey fine sand with trace coarse sand and gravel.	No effervescence. 10 YR 6/2	.		
13						
14						
15						
16						
17						
18						
19						
20			*** Start of filling was at 0828, which starts infiltration.**			

Trench #:	7	**Location:**	VAN DAM FARM
Date Started:	22-May-02	**Total Depth:**	11.8' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 48.9"
Project Number:	27-6830	**Longitude:**	W 118 25' 53.9"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test***		
				Time	**Water Level**	**Trench Depth**
GL	GM	Gravelly sand	.	**906**	**3.4' bgs**	**11.6' td**
1				**949**	**4.2' bgs**	**10.5' td**
2				**1123**	**4.8' bgs**	**8.5' td**
3	SM	Silty fine sand with trace gravel.	Slight effervescence. 10 YR 5/2	**1303**	**5.7' bgs**	**8.3' td**
4				**1507**	**5.9' bgs**	**6.4' td**
5				**1604**	**5.9' bgs**	**6.1' td**
6	SM	Silty medium grain sand with trace clay.	Slight to moderate effervescence. 7.5 YR 6/3	.		
7						
8						
9	SM	Medium grain sand with trace silt and gravel.	Slight effervescence.7.5 YR 5/3	.		
10						
11						
12	SC	Silty clayey fine sand.	No effervescence. 10 YR 7/1	.		
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 0846, which starts infiltration.**			

Trench #:	6	**Location:**	VAN DAM FARM
Date Started:	20-May-02	**Total Depth:**	12' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 27.6"
Project Number:	27-6830	**Longitude:**	W 118 25' 44.8"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test***		
				Time	**Water Level**	**Trench Depth**
GL	SC	Silty clayey fine sand.		**1132**	**4.9' bgs**	**11.2' td**
1				**1255**	**7.5' bgs**	**9.8' td**
2				**1441**	**8.8' bgs**	**9.8' td**
3	SM	Silty gravelly fine sand.	Slight effervescence.Secondary leaching present. 10 YR 5/2	**1612**	**DRY**	**8.9' td**
4						
5						
6	SM	Silty gravelly fine sand with trace clay.	Moderate effervescence. 10 YR 5/3	.		
7						
8						
9	SM	Silty gravelly fine sand.	Slight effervescence. 10 YR 5/3	.		
10	GM	Gravelly sand at 10.5'.	No effervescence. 10 YR 6/2	.		
11	GM	Material coarsing down at 11.5'.	No effervescence. 10 YR 6/2	.		
12						
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1110, which starts infiltration.**			

Trench #:	5	**Location:**	VAN DAM FARM
Date Started:	20-May-02	**Total Depth:**	12.5' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 44.0"
Project Number:	27-6830	**Longitude:**	W 118 25' 07.9"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test* Time**	**Water Level**	**Trench Depth**
GL	SM	Silty fine sand.		**1247**	**3.4' bgs**	**12.0' td**
1				**1448**	**5.9' bgs**	**7.5' td**
2				**1605**	**6.3' bgs**	**7.5' td**
3	SM	Silty fine sand with trace gravel.	Slight effervescence. Secondary leaching.10 YR 6/2			
4				5/22		
5				**658**	**DRY**	**7.4' td**
6	SP	Gravelly fine sand with trace clay	Slight effervescence. 10 YR 5/3	.		
7						
8						
9	SP	Gravelly fine sand with trace clay and silt.	Slight effervescence. 10 YR 5/3	.		
10						
11						
12	SP	Gravelly fine sand with trace clay and silt.	No effervescence.10 YR 5/2	.		
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1230, which starts infiltration.**			

Trench #:	4	**Location:**	VAN DAM FARM
Date Started:	23-May-02	**Total Depth:**	12' BGS
Date Completed:	24-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 18.1"
Project Number:	27-6830	**Longitude:**	W 118 24' 42.7"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	Lithologic Symbol	FORMATION DESCRIPTION and Comments		Infiltration Test* Time	Water Level	Trench Depth
GL	SM	Silty fine sand.		**1056**	**2.1' bgs**	**11.2' td**
1				**1219**	**4.2' bgs**	**10.5' td**
2				**1305**	**4.8' bgs**	**10.5' td**
3	SM	Silty clayey fine sand.	Slight effervescence.Cemented with leaching. 10 YR 5/2	**1522**	**5.8' bgs**	**10.1' td**
4				5/24		
5				**650**	**8.5' bgs**	**9.8' td**
6	SM	Silty fine sand with trace coarse sand.	Moderate effervescence.10 YR 5/2	.		
7						
8						
9	SM	Silty fine sand with trace gravel.	Slight effervescence. 10 YR 6/2	.		
10						
11						
12	SC	Silty clayey fine sand	Slight effervescence. Trace secondary leaching.10 YR 4/2	.		
13						
14						
15						
16						
17						
18						
19						
20			***Start of filling was at 1040, which starts infiltration.**			

Trench #:	3	**Location:**	VAN DAM FARM
Date Started:	20-May-02	**Total Depth:**	14' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 14.5"
Project Number:	27-6830	**Longitude:**	W 118 24' 50.9"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	Lithologic Symbol	FORMATION DESCRIPTION and Comments		Infiltration Test* Time	Water Level	Trench Depth
GL	ML	Silty clayey sand.	.	**934**	**6.0' bgs**	**13.4' td**
1				**1005**	**6.5' bgs**	**13.2' td**
2				**1116**	**7.4' bgs**	**13.2' td**
3	ML	Silty clayey fine sand.	No effervescence. 10 YR 5/3	**1302**	**8.0' bgs**	**13.1' td**
4				**1429**	**8.5' bgs**	**13.1' td**
5				**1639**	**9.2' bgs**	**12.7' td**
6	SM	Silty fine sand with trace gravel.	No effervescence. 10 YR 5/4	5/22		
7				**645**	**10.3' bgs**	**12.2' td**
8						
9						
10	SM	Silty fine sand.	No effervescence. 10 YR 5/4	.		
11						
12	SP	Silty gravelly sand.	Slight effervescence. 10 YR 5/3	.		
13						
14	SM	Silty fine sand	Slight effervescence. 10 YR 6/2	.		
15						
16						
17						
18						
19						
20			***Start of filling was at 0923, which starts infiltration.**	.		

Trench #:	2	**Location:**	VAN DAM FARM
Date Started:	23-May-02	**Total Depth:**	12' BGS
Date Completed:	24-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 31.6"
Project Number:	27-6830	**Longitude:**	W 118 25' 16.8"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test* Time**	**Water Level**	**Trench Depth**
GL	SM	Silty fine sand.	10 YR 5/3	**939**	**2.1' bgs**	**11.7' td**
1				**1006**	**4.2' bgs**	**11.0' td**
2				**1224**	**4.9' bgs**	**10.5' td**
3	SM	Silty fine sand	Slight effervescence. 10 YR 5/3	**1306**	**5.0' bgs**	**10.2' td**
4				**1535**	**5.7' bgs**	**10.1' td**
5				5/24		
6	ML	Silty clayey fine sand with trace coarse sand and gravel.	Slight effervescence. 10 YR 5/3	**742**	**8.2' bgs**	**10.0' td**
7						
8						
9	SW	Medium grain sand with trace gravel.	No effervescence. 10 YR 6/2	.		
10						
11						
12	ML	Silty clayey medium grain sand with trace gravel.	Slight effervescence. 10 YR 5/3	.		
13						
14	ML	Clayey silty fine sand.	Slight effervescence. 10 YR 6/2	.		
15						
16						
17						
18						
19						
20			***Start of filling was at 0922, which starts infiltration.**			

Trench #:	1	**Location:**	VAN DAM FARM
Date Started:	20-May-02	**Total Depth:**	15' BGS
Date Completed:	22-May-02	**Zero Pt. For Logging:**	GROUND SURFACE
Client:	LWDS	**Latitude:**	N 34 49' 30.2"
Project Number:	27-6830	**Longitude:**	W 118 24' 51.6"
Geologist:	LOU KOHN	**Trench Backfill Materials:**	NATIVE
Backhoe Operator:	GLENN (AAA EQUIPMENT)	**Qty Water Used::**	~2000 GALLONS

Depth (ft)	**Lithologic Symbol**	**FORMATION DESCRIPTION and Comments**		**Infiltration Test***		
				Time	**Water Level**	**Trench Depth**
GL	SM	Silty gravelly fine sand.		**1020**	**5.8' bgs**	**13.8' td**
1				**1120**	**6.9' bgs**	**13.7' td**
2				**1306**	**8.3' bgs**	**13.4' td**
3	SM	Silty fine sand.	Slight effervescence. 10 YR 5/4	**1433**	**8.6' bgs**	**13.2' td**
4				**1621**	**9.0' bgs**	**12.2' td**
5	SM	Silty fine sand with trace clay and gravel.	Slight effervescence. 10 YR 5/3	.		
6						
7						
8	SM	Clayey silty fine sand with trace clay.	No effervescence. 10 YR 5/3	.		
9	ML	Clayey silt.	Moderate effervescence. 10 YR 6/1	.		
10						
11	SM	Fine sand with trace silt/clay.	Slight effervescence. 2.5 YR 5/2	.		
12						
13						
14						
15	GM	Silty gravelly sand.	Slight effervescence. 2.5 YR 5/2	.		
16						
17						
18						
19						
20			***Start of filling was at 1002, which starts infiltration.**	.		

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #9

Depth: 9 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	675	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	83	87.7%	12.3%	83
12	1.7000	0.0661	166	75.4%	24.6%	83
30	0.6000	0.0234	360	46.7%	53.3%	194
40	0.4250	0.0165	453	32.9%	67.1%	93
50	0.3000	0.0117	516	23.6%	76.4%	63
100	0.1500	0.0059	607	10.1%	89.9%	91
140	0.1060	0.0041	632	6.4%	93.6%	25
170	0.0900	0.0035	639	5.3%	94.7%	7
200	0.0750	0.0029	648	4.0%	96.0%	9
Pan			674	0.1%	99.9%	26

Total Wt of Sample, grams	674	674
Total Wt of Sample (initial), grams	675	
% Error	0.1%	

Summary	
Gravel	12%
Sand	84%
Sand + Gravel (coarse)	96%
Silt + Clay (fines)	4%
Coarse/Fine Ratio	24.92

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #16

Depth: 8 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	593	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	13	97.8%	2.2%	13
12	1.7000	0.0661	29	95.1%	4.9%	16
30	0.6000	0.0234	82	86.2%	13.8%	53
40	0.4250	0.0165	112	81.1%	18.9%	30
50	0.3000	0.0117	140	76.4%	23.6%	28
100	0.1500	0.0059	240	59.5%	40.5%	100
140	0.1060	0.0041	312	47.4%	52.6%	72
170	0.0900	0.0035	352	40.6%	59.4%	40
200	0.0750	0.0029	405	31.7%	68.3%	53
Pan			593	0.0%	100.0%	188
Total Wt of Sample, grams			593			593
Total Wt of Sample (initial), grams			593			
% Error			0.0%			

Summary	
Gravel	2.2%
Sand + Gravel (Coarse)	68.3%
Sand	66.1%
Silt + Clay (Fines)	31.7%
Coarse/Fine Ratio	2.15

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #16

Depth: 6 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	528	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	12	97.7%	2.3%	12
12	1.7000	0.0661	38	92.8%	7.2%	26
30	0.6000	0.0234	127	75.9%	24.1%	89
40	0.4250	0.0165	176	66.7%	33.3%	49
50	0.3000	0.0117	215	59.3%	40.7%	39
100	0.1500	0.0059	325	38.4%	61.6%	110
140	0.1060	0.0041	383	27.5%	72.5%	58
170	0.0900	0.0035	411	22.2%	77.8%	28
200	0.0750	0.0029	422	20.1%	79.9%	11
Pan			529	-0.2%	100.2%	107
Total Wt of Sample, grams			529			529
Total Wt of Sample (initial), grams			528			
% Error			-0.2%			

Summary	
Gravel	2.3%
Sand + Gravel (Coarse)	79.9%
Sand	77.7%
Silt + Clay (Fines)	20.3%

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #16

Depth: 3 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	491	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	0	100.0%	0.0%	0
12	1.7000	0.0661	10	98.0%	2.0%	10
30	0.6000	0.0234	50	89.8%	10.2%	40
40	0.4250	0.0165	79	83.9%	16.1%	29
50	0.3000	0.0117	111	77.4%	22.6%	32
100	0.1500	0.0059	210	57.2%	42.8%	99
140	0.1060	0.0041	282	42.6%	57.4%	72
170	0.0900	0.0035	311	36.7%	63.3%	29
200	0.0750	0.0029	331	32.6%	67.4%	20
Pan			490	0.2%	99.8%	159

Total Wt of Sample, grams	490	490
Total Wt of Sample (initial), grams	491	
% Error	0.2%	

Summary	
Gravel	0.0%
Sand + Gravel (Coarse)	67.4%
Sand	67.4%
Silt + Clay (Fines)	32.4%
Coarse/Fine Ratio	2.08

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #15

Depth: 9 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	363	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	1	99.7%	0.3%	1
12	1.7000	0.0661	9	97.5%	2.5%	8
30	0.6000	0.0234	79	78.2%	21.8%	70
40	0.4250	0.0165	119	67.2%	32.8%	40
50	0.3000	0.0117	146	59.8%	40.2%	27
100	0.1500	0.0059	208	42.7%	57.3%	62
140	0.1060	0.0041	240	33.9%	66.1%	32
170	0.0900	0.0035	257	29.2%	70.8%	17
200	0.0750	0.0029	276	24.0%	76.0%	19
Pan			363	0.0%	100.0%	87

Total Wt of Sample, grams	363	363
Total Wt of Sample (initial), grams	363	
% Error	0.0%	

Summary	
Gravel	0.3%
Sand + Gravel (Coarse)	76.0%
Sand	75.8%
Silt + Clay (Fines)	24.0%
Coarse/Fine Ratio	3.17

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #15

Depth: 6 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	668	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	22	96.7%	3.3%	22
12	1.7000	0.0661	60	91.0%	9.0%	38
30	0.6000	0.0234	172	74.3%	25.7%	112
40	0.4250	0.0165	235	64.8%	35.2%	63
50	0.3000	0.0117	292	56.3%	43.7%	57
100	0.1500	0.0059	448	32.9%	67.1%	156
140	0.1060	0.0041	520	22.2%	77.8%	72
170	0.0900	0.0035	543	18.7%	81.3%	23
200	0.0750	0.0029	569	14.8%	85.2%	26
Pan			667	0.1%	99.9%	98

Total Wt of Sample, grams	667	667
Total Wt of Sample (initial), grams	668	
% Error	0.1%	

Summary	
Gravel	3.3%
Sand + Gravel (Coarse)	85.2%
Sand	81.9%
Silt + Clay (Fines)	14.7%
Coarse/Fine Ratio	5.81

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #15

Depth: 3 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	431	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	3	99.3%	0.7%	3
12	1.7000	0.0661	19	95.6%	4.4%	16
30	0.6000	0.0234	73	83.1%	16.9%	54
40	0.4250	0.0165	104	75.9%	24.1%	31
50	0.3000	0.0117	132	69.4%	30.6%	28
100	0.1500	0.0059	228	47.1%	52.9%	96
140	0.1060	0.0041	275	36.2%	63.8%	47
170	0.0900	0.0035	296	31.3%	68.7%	21
200	0.0750	0.0029	325	24.6%	75.4%	29
Pan			431	0.0%	100.0%	106

Total Wt of Sample, grams	431	431
Total Wt of Sample (initial), grams	431	
% Error	0.0%	

Summary	
Gravel	0.7%
Sand + Gravel (Coarse)	75.4%
Sand	74.7%
Silt + Clay (Fines)	24.6%
Coarse/Fine Ratio	3.07

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #14

Depth: 9 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	406	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	5	98.8%	1.2%	5
12	1.7000	0.0661	18	95.6%	4.4%	13
30	0.6000	0.0234	79	80.5%	19.5%	61
40	0.4250	0.0165	117	71.2%	28.8%	38
50	0.3000	0.0117	147	63.8%	36.2%	30
100	0.1500	0.0059	245	39.7%	60.3%	98
140	0.1060	0.0041	296	27.1%	72.9%	51
170	0.0900	0.0035	319	21.4%	78.6%	23
200	0.0750	0.0029	340	16.3%	83.7%	21
Pan			407	-0.2%	100.2%	67
Total Wt of Sample, grams			407			407
Total Wt of Sample (initial), grams			406			
% Error			-0.2%			

Summary	
Gravel	1.2%
Sand + Gravel (Coarse)	83.7%
Sand	82.5%
Silt + Clay (Fines)	16.5%
Coarse/Fine Ratio	5.07

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #14

Depth: 6 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	417	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	3	99.3%	0.7%	3
12	1.7000	0.0661	24	94.2%	5.8%	21
30	0.6000	0.0234	100	76.0%	24.0%	76
40	0.4250	0.0165	145	65.2%	34.8%	45
50	0.3000	0.0117	181	56.6%	43.4%	36
100	0.1500	0.0059	275	34.1%	65.9%	94
140	0.1060	0.0041	320	23.3%	76.7%	45
170	0.0900	0.0035	335	19.7%	80.3%	15
200	0.0750	0.0029	352	15.6%	84.4%	17
Pan			417	0.0%	100.0%	65
Total Wt of Sample, grams			417			417
Total Wt of Sample (initial), grams			417			
% Error			0.0%			

Summary	
Gravel	0.7%
Sand + Gravel (Coarse)	84.4%
Sand	83.7%
Silt + Clay (Fines)	15.6%
Coarse/Fine Ratio	5.42

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #14

Depth: 3 ft

Tested By: LK

Test Date: 05-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	491	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.2%	0.8%	4
12	1.7000	0.0661	14	97.1%	2.9%	10
30	0.6000	0.0234	71	85.5%	14.5%	57
40	0.4250	0.0165	113	77.0%	23.0%	42
50	0.3000	0.0117	142	71.1%	28.9%	29
100	0.1500	0.0059	225	54.2%	45.8%	83
140	0.1060	0.0041	281	42.8%	57.2%	56
170	0.0900	0.0035	315	35.8%	64.2%	34
200	0.0750	0.0029	346	29.5%	70.5%	31
Pan			490	0.2%	99.8%	144

Total Wt of Sample, grams	490	490
Total Wt of Sample (initial), grams	491	
% Error	0.2%	

Summary	
Gravel	0.8%
Sand + Gravel (Coarse)	70.5%
Sand	69.7%
Silt + Clay (Fines)	29.3%
Coarse/Fine Ratio	2.40

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #13

Depth: 9 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	627	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	96	84.7%	15.3%	96
12	1.7000	0.0661	206	67.1%	32.9%	110
30	0.6000	0.0234	386	38.4%	61.6%	180
40	0.4250	0.0165	464	26.0%	74.0%	78
50	0.3000	0.0117	514	18.0%	82.0%	50
100	0.1500	0.0059	589	6.1%	93.9%	75
140	0.1060	0.0041	604	3.7%	96.3%	15
170	0.0900	0.0035	610	2.7%	97.3%	6
200	0.0750	0.0029	615	1.9%	98.1%	5
Pan			627	0.0%	100.0%	12

Total Wt of Sample, grams	627	627
Total Wt of Sample (initial), grams	627	
% Error	0.0%	

Summary	
Gravel	15.3%
Sand + Gravel (Coarse)	98.1%
Sand	82.8%
Silt + Clay (Fines)	1.9%
Coarse/Fine Ratio	51.25

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #13

Depth: 6 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	511	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.6%	0.4%	2
12	1.7000	0.0661	28	94.5%	5.5%	26
30	0.6000	0.0234	134	73.8%	26.2%	106
40	0.4250	0.0165	197	61.4%	38.6%	63
50	0.3000	0.0117	248	51.5%	48.5%	51
100	0.1500	0.0059	379	25.8%	74.2%	131
140	0.1060	0.0041	425	16.8%	83.2%	46
170	0.0900	0.0035	441	13.7%	86.3%	16
200	0.0750	0.0029	459	10.2%	89.8%	18
Pan			510	0.2%	99.8%	51

Total Wt of Sample, grams	510	510
Total Wt of Sample (initial), grams	511	
% Error	0.2%	

Summary	
Gravel	0.4%
Sand + Gravel (Coarse)	89.8%
Sand	89.4%
Silt + Clay (Fines)	10.0%
Coarse/Fine Ratio	9.00

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #13

Depth: 3 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	515	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.6%	0.4%	2
12	1.7000	0.0661	16	96.9%	3.1%	14
30	0.6000	0.0234	66	87.2%	12.8%	50
40	0.4250	0.0165	100	80.6%	19.4%	34
50	0.3000	0.0117	136	73.6%	26.4%	36
100	0.1500	0.0059	288	44.1%	55.9%	152
140	0.1060	0.0041	365	29.1%	70.9%	77
170	0.0900	0.0035	393	23.7%	76.3%	28
200	0.0750	0.0029	428	16.9%	83.1%	35
Pan			516	-0.2%	100.2%	88

Total Wt of Sample, grams	516	516
Total Wt of Sample (initial), grams	515	
% Error	-0.2%	

Summary	
Gravel	0.4%
Sand + Gravel (Coarse)	83.1%
Sand	82.7%
Silt + Clay (Fines)	17.1%
Coarse/Fine Ratio	4.86

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #12

Depth: 9 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	617	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	15	97.6%	2.4%	15
12	1.7000	0.0661	73	88.2%	11.8%	58
30	0.6000	0.0234	259	58.0%	42.0%	186
40	0.4250	0.0165	357	42.1%	57.9%	98
50	0.3000	0.0117	428	30.6%	69.4%	71
100	0.1500	0.0059	555	10.0%	90.0%	127
140	0.1060	0.0041	582	5.7%	94.3%	27
170	0.0900	0.0035	591	4.2%	95.8%	9
200	0.0750	0.0029	601	2.6%	97.4%	10
Pan			617	0.0%	100.0%	16

Total Wt of Sample, grams	617	617
Total Wt of Sample (initial), grams	617	
% Error	0.0%	

Summary	
Gravel	2.4%
Sand + Gravel (Coarse)	97.4%
Sand	95.0%
Silt + Clay (Fines)	2.6%
Coarse/Fine Ratio	37.56

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #12

Depth: 6 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	463	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	5	98.9%	1.1%	5
12	1.7000	0.0661	26	94.4%	5.6%	21
30	0.6000	0.0234	105	77.3%	22.7%	79
40	0.4250	0.0165	150	67.6%	32.4%	45
50	0.3000	0.0117	189	59.2%	40.8%	39
100	0.1500	0.0059	288	37.8%	62.2%	99
140	0.1060	0.0041	337	27.2%	72.8%	49
170	0.0900	0.0035	354	23.5%	76.5%	17
200	0.0750	0.0029	374	19.2%	80.8%	20
Pan			464	-0.2%	100.2%	90

Total Wt of Sample, grams	464	464
Total Wt of Sample (initial), grams	463	
% Error	-0.2%	

Summary	
Gravel	1.1%
Sand + Gravel (Coarse)	80.8%
Sand	79.7%
Silt + Clay (Fines)	19.4%
Coarse/Fine Ratio	4.16

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #12

Depth: 3 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	511	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	1	99.8%	0.2%	1
12	1.7000	0.0661	10	98.0%	2.0%	9
30	0.6000	0.0234	71	86.1%	13.9%	61
40	0.4250	0.0165	121	76.3%	23.7%	50
50	0.3000	0.0117	165	67.7%	32.3%	44
100	0.1500	0.0059	290	43.2%	56.8%	125
140	0.1060	0.0041	347	32.1%	67.9%	57
170	0.0900	0.0035	371	27.4%	72.6%	24
200	0.0750	0.0029	400	21.7%	78.3%	29
Pan			510	0.2%	99.8%	110
Total Wt of Sample, grams			510			510
Total Wt of Sample (initial), grams			511			
% Error			0.2%			

Summary	
Gravel	0.2%
Sand + Gravel (Coarse)	78.3%
Sand	78.1%
Silt + Clay (Fines)	21.5%
Coarse/Fine Ratio	3.64

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #11

Depth: 9 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	847	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	25	97.0%	3.0%	25
12	1.7000	0.0661	85	90.0%	10.0%	60
30	0.6000	0.0234	295	65.2%	34.8%	210
40	0.4250	0.0165	412	51.4%	48.6%	117
50	0.3000	0.0117	503	40.6%	59.4%	91
100	0.1500	0.0059	697	17.7%	82.3%	194
140	0.1060	0.0041	767	9.4%	90.6%	70
170	0.0900	0.0035	786	7.2%	92.8%	19
200	0.0750	0.0029	801	5.4%	94.6%	15
Pan			847	0.0%	100.0%	46

Total Wt of Sample, grams	847	847
Total Wt of Sample (initial), grams	847	
% Error	0.0%	

Summary	
Gravel	3.0%
Sand + Gravel (Coarse)	94.6%
Sand	91.6%
Silt + Clay (Fines)	5.4%
Coarse/Fine Ratio	17.41

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #11

Depth: 6 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	780	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	10	98.7%	1.3%	10
12	1.7000	0.0661	70	91.0%	9.0%	60
30	0.6000	0.0234	253	67.6%	32.4%	183
40	0.4250	0.0165	351	55.0%	45.0%	98
50	0.3000	0.0117	426	45.4%	54.6%	75
100	0.1500	0.0059	607	22.2%	77.8%	181
140	0.1060	0.0041	673	13.7%	86.3%	66
170	0.0900	0.0035	698	10.5%	89.5%	25
200	0.0750	0.0029	723	7.3%	92.7%	25
Pan			778	0.3%	99.7%	55

Total Wt of Sample, grams	778	778
Total Wt of Sample (initial), grams	780	
% Error	0.3%	

Summary	
Gravel	1.3%
Sand + Gravel (Coarse)	92.7%
Sand	91.4%
Silt + Clay (Fines)	7.1%
Coarse/Fine Ratio	13.15

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #11

Depth: 3 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	672	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	7	99.0%	1.0%	7
12	1.7000	0.0661	49	92.7%	7.3%	42
30	0.6000	0.0234	186	72.3%	27.7%	137
40	0.4250	0.0165	258	61.6%	38.4%	72
50	0.3000	0.0117	321	52.2%	47.8%	63
100	0.1500	0.0059	499	25.7%	74.3%	178
140	0.1060	0.0041	574	14.6%	85.4%	75
170	0.0900	0.0035	601	10.6%	89.4%	27
200	0.0750	0.0029	627	6.7%	93.3%	26
Pan			672	0.0%	100.0%	45

Total Wt of Sample, grams	672	672
Total Wt of Sample (initial), grams	672	
% Error	0.0%	

Summary	
Gravel	1.0%
Sand + Gravel (Coarse)	93.3%
Sand	92.3%
Silt + Clay (Fines)	6.7%
Coarse/Fine Ratio	13.93

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #10

Depth: 9 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	631	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	5	99.2%	0.8%	5
12	1.7000	0.0661	27	95.7%	4.3%	22
30	0.6000	0.0234	118	81.3%	18.7%	91
40	0.4250	0.0165	194	69.3%	30.7%	76
50	0.3000	0.0117	271	57.1%	42.9%	77
100	0.1500	0.0059	470	25.5%	74.5%	199
140	0.1060	0.0041	548	13.2%	86.8%	78
170	0.0900	0.0035	571	9.5%	90.5%	23
200	0.0750	0.0029	590	6.5%	93.5%	19
Pan			632	-0.2%	100.2%	42

Total Wt of Sample, grams	632	632
Total Wt of Sample (initial), grams	631	
% Error	-0.2%	

Summary	
Gravel	0.8%
Sand + Gravel (Coarse)	93.5%
Sand	92.7%
Silt + Clay (Fines)	6.7%
Coarse/Fine Ratio	14.05

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #10

Depth: 6 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	665	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	13	98.0%	2.0%	13
12	1.7000	0.0661	77	88.4%	11.6%	64
30	0.6000	0.0234	265	60.2%	39.8%	188
40	0.4250	0.0165	366	45.0%	55.0%	101
50	0.3000	0.0117	448	32.6%	67.4%	82
100	0.1500	0.0059	595	10.5%	89.5%	147
140	0.1060	0.0041	626	5.9%	94.1%	31
170	0.0900	0.0035	637	4.2%	95.8%	11
200	0.0750	0.0029	645	3.0%	97.0%	8
Pan			665	0.0%	100.0%	20

Total Wt of Sample, grams	665	665
Total Wt of Sample (initial), grams	665	
% Error	0.0%	

Summary	
Gravel	2.0%
Sand + Gravel (Coarse)	97.0%
Sand	95.0%
Silt + Clay (Fines)	3.0%
Coarse/Fine Ratio	32.25

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #10

Depth: 3 ft

Tested By: LK

Test Date: 03-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	700	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	36	94.9%	5.1%	36
12	1.7000	0.0661	89	87.3%	12.7%	53
30	0.6000	0.0234	238	66.0%	34.0%	149
40	0.4250	0.0165	322	54.0%	46.0%	84
50	0.3000	0.0117	398	43.1%	56.9%	76
100	0.1500	0.0059	569	18.7%	81.3%	171
140	0.1060	0.0041	621	11.3%	88.7%	52
170	0.0900	0.0035	640	8.6%	91.4%	19
200	0.0750	0.0029	659	5.9%	94.1%	19
Pan			699	0.1%	99.9%	40

Total Wt of Sample, grams	699	699
Total Wt of Sample (initial), grams	700	
% Error	0.1%	

Summary	
Gravel	5.1%
Sand + Gravel (Coarse)	94.1%
Sand	89.0%
Silt + Clay (Fines)	5.7%
Coarse/Fine Ratio	16.48

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #9A

Depth: 9 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	766	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	101	86.8%	13.2%	101
12	1.7000	0.0661	207	73.0%	27.0%	106
30	0.6000	0.0234	372	51.4%	48.6%	165
40	0.4250	0.0165	446	41.8%	58.2%	74
50	0.3000	0.0117	500	34.7%	65.3%	54
100	0.1500	0.0059	618	19.3%	80.7%	118
140	0.1060	0.0041	667	12.9%	87.1%	49
170	0.0900	0.0035	686	10.4%	89.6%	19
200	0.0750	0.0029	710	7.3%	92.7%	24
Pan			766	0.0%	100.0%	56

Total Wt of Sample, grams	766	766
Total Wt of Sample (initial), grams	766	
% Error	0.0%	

Summary	
Gravel	13.2%
Sand + Gravel (Coarse)	92.7%
Sand	79.5%
Silt + Clay (Fines)	7.3%
Coarse/Fine Ratio	12.68

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #9A

Depth: 6 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	521	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	5	99.0%	1.0%	5
12	1.7000	0.0661	31	94.0%	6.0%	26
30	0.6000	0.0234	100	80.8%	19.2%	69
40	0.4250	0.0165	147	71.8%	28.2%	47
50	0.3000	0.0117	191	63.3%	36.7%	44
100	0.1500	0.0059	320	38.6%	61.4%	129
140	0.1060	0.0041	379	27.3%	72.7%	59
170	0.0900	0.0035	403	22.6%	77.4%	24
200	0.0750	0.0029	425	18.4%	81.6%	22
Pan			522	-0.2%	100.2%	97

Total Wt of Sample, grams	522	522
Total Wt of Sample (initial), grams	521	
% Error	-0.2%	

Summary	
Gravel	1%
Sand	81%
Sand + Gravel (coarse)	82%
Silt + Clay (fines)	19%
Coarse/Fine Ratio	4.38

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #9A

Depth: 3 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	472	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	8	98.3%	1.7%	8
12	1.7000	0.0661	33	93.0%	7.0%	25
30	0.6000	0.0234	104	78.0%	22.0%	71
40	0.4250	0.0165	150	68.2%	31.8%	46
50	0.3000	0.0117	194	58.9%	41.1%	44
100	0.1500	0.0059	297	37.1%	62.9%	103
140	0.1060	0.0041	339	28.2%	71.8%	42
170	0.0900	0.0035	355	24.8%	75.2%	16
200	0.0750	0.0029	371	21.4%	78.6%	16
Pan			471	0.2%	99.8%	100

Total Wt of Sample, grams	471	471
Total Wt of Sample (initial), grams	472	
% Error	0.2%	

Summary	
Gravel	2%
Sand	77%
Sand + Gravel (coarse)	79%
Silt + Clay (fines)	21%
Coarse/Fine Ratio	3.71

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #9

Depth: 6 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	386	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	8	97.9%	2.1%	8
12	1.7000	0.0661	17	95.6%	4.4%	9
30	0.6000	0.0234	60	84.5%	15.5%	43
40	0.4250	0.0165	87	77.5%	22.5%	27
50	0.3000	0.0117	106	72.5%	27.5%	19
100	0.1500	0.0059	177	54.1%	45.9%	71
140	0.1060	0.0041	232	39.9%	60.1%	55
170	0.0900	0.0035	255	33.9%	66.1%	23
200	0.0750	0.0029	270	30.1%	69.9%	15
Pan			385	0.3%	99.7%	115
Total Wt of Sample, grams			385			385
Total Wt of Sample (initial), grams			386			
% Error			0.3%			

Summary	
Gravel	2%
Sand	68%
Sand + Gravel (coarse)	70%
Silt + Clay (fines)	30%
Coarse/Fine Ratio	2.35

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #9

Depth: 3 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	592	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	36	93.9%	6.1%	36
12	1.7000	0.0661	94	84.1%	15.9%	58
30	0.6000	0.0234	237	60.0%	40.0%	143
40	0.4250	0.0165	311	47.5%	52.5%	74
50	0.3000	0.0117	365	38.3%	61.7%	54
100	0.1500	0.0059	483	18.4%	81.6%	118
140	0.1060	0.0041	524	11.5%	88.5%	41
170	0.0900	0.0035	537	9.3%	90.7%	13
200	0.0750	0.0029	549	7.3%	92.7%	12
Pan			593	-0.2%	100.2%	44

Total Wt of Sample, grams	593	593
Total Wt of Sample (initial), grams	592	
% Error	-0.2%	

Summary	
Gravel	6%
Sand	87%
Sand + Gravel (coarse)	93%
Silt + Clay (fines)	7%
Coarse/Fine Ratio	12.48

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #8

Depth: 9 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	428	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	11	97.4%	2.6%	11
12	1.7000	0.0661	18	95.8%	4.2%	7
30	0.6000	0.0234	79	81.5%	18.5%	61
40	0.4250	0.0165	117	72.7%	27.3%	38
50	0.3000	0.0117	148	65.4%	34.6%	31
100	0.1500	0.0059	240	43.9%	56.1%	92
140	0.1060	0.0041	285	33.4%	66.6%	45
170	0.0900	0.0035	306	28.5%	71.5%	21
200	0.0750	0.0029	326	23.8%	76.2%	20
Pan			429	-0.2%	100.2%	103

Total Wt of Sample, grams	429	429
Total Wt of Sample (initial), grams	428	
% Error	-0.2%	

Summary	
Gravel	3%
Sand	74%
Sand + Gravel (coarse)	76%
Silt + Clay (fines)	24%
Coarse/Fine Ratio	3.17

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #8

Depth: 6 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	492	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.6%	0.4%	2
12	1.7000	0.0661	4	99.2%	0.8%	2
30	0.6000	0.0234	37	92.5%	7.5%	33
40	0.4250	0.0165	66	86.6%	13.4%	29
50	0.3000	0.0117	97	80.3%	19.7%	31
100	0.1500	0.0059	188	61.8%	38.2%	91
140	0.1060	0.0041	240	51.2%	48.8%	52
170	0.0900	0.0035	276	43.9%	56.1%	36
200	0.0750	0.0029	312	36.6%	63.4%	36
Pan			491	0.2%	99.8%	179
Total Wt of Sample, grams			491			491
Total Wt of Sample (initial), grams			492			
% Error			0.2%			

Summary	
Gravel	0%
Sand	63%
Sand + Gravel (coarse)	63%
Silt + Clay (fines)	36%
Coarse/Fine Ratio	1.74

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #8

Depth: 3 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	434	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	0	100.0%	0.0%	0
12	1.7000	0.0661	1	99.8%	0.2%	1
30	0.6000	0.0234	23	94.7%	5.3%	22
40	0.4250	0.0165	53	87.8%	12.2%	30
50	0.3000	0.0117	88	79.7%	20.3%	35
100	0.1500	0.0059	191	56.0%	44.0%	103
140	0.1060	0.0041	249	42.6%	57.4%	58
170	0.0900	0.0035	276	36.4%	63.6%	27
200	0.0750	0.0029	299	31.1%	68.9%	23
Pan			434	0.0%	100.0%	135
Total Wt of Sample, grams			434			434
Total Wt of Sample (initial), grams			434			
% Error			0.0%			

Summary	
Gravel	0%
Sand	69%
Sand + Gravel (coarse)	69%
Silt + Clay (fines)	31%
Coarse/Fine Ratio	2.21

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #7

Depth: 9 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	553	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	9	98.4%	1.6%	9
12	1.7000	0.0661	25	95.5%	4.5%	16
30	0.6000	0.0234	139	74.9%	25.1%	114
40	0.4250	0.0165	208	62.4%	37.6%	69
50	0.3000	0.0117	257	53.5%	46.5%	49
100	0.1500	0.0059	363	34.4%	65.6%	106
140	0.1060	0.0041	403	27.1%	72.9%	40
170	0.0900	0.0035	423	23.5%	76.5%	20
200	0.0750	0.0029	444	19.7%	80.3%	21
Pan			552	0.2%	99.8%	108

Total Wt of Sample, grams	552	552
Total Wt of Sample (initial), grams	553	
% Error	0.2%	

Summary	
Gravel	2%
Sand	79%
Sand + Gravel (coarse)	80%
Silt + Clay (fines)	20%
Coarse/Fine Ratio	4.11

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #7

Depth: 6 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	418	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	19	95.5%	4.5%	19
12	1.7000	0.0661	38	90.9%	9.1%	19
30	0.6000	0.0234	107	74.4%	25.6%	69
40	0.4250	0.0165	148	64.6%	35.4%	41
50	0.3000	0.0117	179	57.2%	42.8%	31
100	0.1500	0.0059	257	38.5%	61.5%	78
140	0.1060	0.0041	287	31.3%	68.7%	30
170	0.0900	0.0035	300	28.2%	71.8%	13
200	0.0750	0.0029	317	24.2%	75.8%	17
Pan			419	-0.2%	100.2%	102
Total Wt of Sample, grams			419			419
Total Wt of Sample (initial), grams			418			
% Error			-0.2%			

Summary	
Gravel	5%
Sand	71%
Sand + Gravel (coarse)	76%
Silt + Clay (fines)	24%
Coarse/Fine Ratio	3.11

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #7

Depth: 3 ft

Tested By: LK

Test Date: 01-Jun-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	426	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.1%	0.9%	4
12	1.7000	0.0661	31	92.7%	7.3%	27
30	0.6000	0.0234	112	73.7%	26.3%	81
40	0.4250	0.0165	179	58.0%	42.0%	67
50	0.3000	0.0117	224	47.4%	52.6%	45
100	0.1500	0.0059	324	23.9%	76.1%	100
140	0.1060	0.0041	359	15.7%	84.3%	35
170	0.0900	0.0035	373	12.4%	87.6%	14
200	0.0750	0.0029	386	9.4%	90.6%	13
Pan			426	0.0%	100.0%	40

Total Wt of Sample, grams	426	426
Total Wt of Sample (initial), grams	426	
% Error	0.0%	

Summary	
Gravel	0.9%
Sand + Gravel (Coarse)	90.6%
Sand	89.7%
Silt + Clay (Fines)	9.4%
Coarse/Fine Ratio	9.65

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #6

Depth: 11.5 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	863	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	238	72.4%	27.6%	238
12	1.7000	0.0661	346	59.9%	40.1%	108
30	0.6000	0.0234	564	34.6%	65.4%	218
40	0.4250	0.0165	654	24.2%	75.8%	90
50	0.3000	0.0117	708	18.0%	82.0%	54
100	0.1500	0.0059	783	9.3%	90.7%	75
140	0.1060	0.0041	801	7.2%	92.8%	18
170	0.0900	0.0035	810	6.1%	93.9%	9
200	0.0750	0.0029	819	5.1%	94.9%	9
Pan			863	0.0%	100.0%	44

Total Wt of Sample, grams	863	863
Total Wt of Sample (initial), grams	863	
% Error	0.0%	

Summary	
Gravel	27.6%
Sand + Gravel (Coarse)	94.9%
Sand	67.3%
Silt + Clay (Fines)	5.1%
Coarse/Fine Ratio	18.61

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #6

Depth: 9 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	484	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.2%	0.8%	4
12	1.7000	0.0661	27	94.4%	5.6%	23
30	0.6000	0.0234	110	77.3%	22.7%	83
40	0.4250	0.0165	154	68.2%	31.8%	44
50	0.3000	0.0117	188	61.2%	38.8%	34
100	0.1500	0.0059	281	41.9%	58.1%	93
140	0.1060	0.0041	329	32.0%	68.0%	48
170	0.0900	0.0035	351	27.5%	72.5%	22
200	0.0750	0.0029	376	22.3%	77.7%	25
Pan			483	0.2%	99.8%	107

Total Wt of Sample, grams	483	483
Total Wt of Sample (initial), grams	484	
% Error	0.2%	

Summary	
Gravel	0.8%
Sand + Gravel (Coarse)	77.7%
Sand	76.9%
Silt + Clay (Fines)	22.1%
Coarse/Fine Ratio	3.51

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #6

Depth: 6 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	487	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.6%	0.4%	2
12	1.7000	0.0661	28	94.3%	5.7%	26
30	0.6000	0.0234	124	74.5%	25.5%	96
40	0.4250	0.0165	190	61.0%	39.0%	66
50	0.3000	0.0117	242	50.3%	49.7%	52
100	0.1500	0.0059	345	29.2%	70.8%	103
140	0.1060	0.0041	377	22.6%	77.4%	32
170	0.0900	0.0035	389	20.1%	79.9%	12
200	0.0750	0.0029	401	17.7%	82.3%	12
Pan			485	0.4%	99.6%	84
Total Wt of Sample, grams			485			485
Total Wt of Sample (initial), grams			487			
% Error			0.4%			

Summary	
Gravel	0.4%
Sand + Gravel (Coarse)	82.3%
Sand	81.9%
Silt + Clay (Fines)	17.2%
Coarse/Fine Ratio	4.77

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #6

Depth: 3 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	516	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.6%	0.4%	2
12	1.7000	0.0661	26	95.0%	5.0%	24
30	0.6000	0.0234	135	73.8%	26.2%	109
40	0.4250	0.0165	209	59.5%	40.5%	74
50	0.3000	0.0117	268	48.1%	51.9%	59
100	0.1500	0.0059	381	26.2%	73.8%	113
140	0.1060	0.0041	419	18.8%	81.2%	38
170	0.0900	0.0035	432	16.3%	83.7%	13
200	0.0750	0.0029	444	14.0%	86.0%	12
Pan			517	-0.2%	100.2%	73

Total Wt of Sample, grams	517	517
Total Wt of Sample (initial), grams	516	
% Error	-0.2%	

Summary	
Gravel	0.4%
Sand + Gravel (Coarse)	86.0%
Sand	85.7%
Silt + Clay (Fines)	14.1%
Coarse/Fine Ratio	6.08

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #5

Depth: 9 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	590	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.7%	0.3%	2
12	1.7000	0.0661	19	96.8%	3.2%	17
30	0.6000	0.0234	94	84.1%	15.9%	75
40	0.4250	0.0165	147	75.1%	24.9%	53
50	0.3000	0.0117	193	67.3%	32.7%	46
100	0.1500	0.0059	313	46.9%	53.1%	120
140	0.1060	0.0041	360	39.0%	61.0%	47
170	0.0900	0.0035	400	32.2%	67.8%	40
200	0.0750	0.0029	430	27.1%	72.9%	30
Pan			590	0.0%	100.0%	160

Total Wt of Sample, grams	590	590
Total Wt of Sample (initial), grams	590	
% Error	0.0%	

Summary	
Gravel	0.3%
Sand + Gravel (Coarse)	72.9%
Sand	72.5%
Silt + Clay (Fines)	27.1%
Coarse/Fine Ratio	2.69

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #5

Depth: 6 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	485	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	5	99.0%	1.0%	5
12	1.7000	0.0661	30	93.8%	6.2%	25
30	0.6000	0.0234	116	76.1%	23.9%	86
40	0.4250	0.0165	173	64.3%	35.7%	57
50	0.3000	0.0117	217	55.3%	44.7%	44
100	0.1500	0.0059	323	33.4%	66.6%	106
140	0.1060	0.0041	369	23.9%	76.1%	46
170	0.0900	0.0035	392	19.2%	80.8%	23
200	0.0750	0.0029	413	14.8%	85.2%	21
Pan			485	0.0%	100.0%	72
Total Wt of Sample, grams			485			485
Total Wt of Sample (initial), grams			485			
% Error			0.0%			

Summary	
Gravel	1.0%
Sand + Gravel (Coarse)	85.2%
Sand	84.1%
Silt + Clay (Fines)	14.8%
Coarse/Fine Ratio	5.74

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #5

Depth: 3 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	462	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	1	99.8%	0.2%	1
12	1.7000	0.0661	12	97.4%	2.6%	11
30	0.6000	0.0234	67	85.5%	14.5%	55
40	0.4250	0.0165	131	71.6%	28.4%	64
50	0.3000	0.0117	169	63.4%	36.6%	38
100	0.1500	0.0059	282	39.0%	61.0%	113
140	0.1060	0.0041	320	30.7%	69.3%	38
170	0.0900	0.0035	344	25.5%	74.5%	24
200	0.0750	0.0029	370	19.9%	80.1%	26
Pan			457	1.1%	98.9%	87

Total Wt of Sample, grams	457	457
Total Wt of Sample (initial), grams	462	
% Error	1.1%	

Summary	
Gravel	13.20%
Sand + Gravel (Coarse)	92.70%
Sand	79.50%
Silt + Clay (Fines)	7.30%
Coarse/Fine Ratio	12.68

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #4

Depth: 9 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	523	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	15	97.1%	2.9%	15
12	1.7000	0.0661	50	90.4%	9.6%	35
30	0.6000	0.0234	139	73.4%	26.6%	89
40	0.4250	0.0165	190	63.7%	36.3%	51
50	0.3000	0.0117	234	55.3%	44.7%	44
100	0.1500	0.0059	345	34.0%	66.0%	111
140	0.1060	0.0041	406	22.4%	77.6%	61
170	0.0900	0.0035	433	17.2%	82.8%	27
200	0.0750	0.0029	455	13.0%	87.0%	22
Pan			522	0.2%	99.8%	67

Total Wt of Sample, grams	522	522
Total Wt of Sample (initial), grams	523	
% Error	0.2%	

Summary

Gravel	13.20%
Sand + Gravel (Coarse)	92.70%
Sand	79.50%
Silt + Clay (Fines)	7.30%
Coarse/Fine Ratio	12.68

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #4

Depth: 6 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	469	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	3	99.4%	0.6%	3
12	1.7000	0.0661	11	97.7%	2.3%	8
30	0.6000	0.0234	69	85.3%	14.7%	58
40	0.4250	0.0165	111	76.3%	23.7%	42
50	0.3000	0.0117	146	68.9%	31.1%	35
100	0.1500	0.0059	251	46.5%	53.5%	105
140	0.1060	0.0041	308	34.3%	65.7%	57
170	0.0900	0.0035	335	28.6%	71.4%	27
200	0.0750	0.0029	361	23.0%	77.0%	26
Pan			468	0.2%	99.8%	107

Total Wt of Sample, grams	468	468
Total Wt of Sample (initial), grams	469	
% Error	0.2%	

Summary	
Gravel	0.6%
Sand + Gravel (Coarse)	77.0%
Sand	76.3%
Silt + Clay (Fines)	22.8%
Coarse/Fine Ratio	3.37

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #4

Depth: 3 ft

Tested By: LK

Test Date: 31-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	408	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	1	99.8%	0.2%	1
12	1.7000	0.0661	10	97.5%	2.5%	9
30	0.6000	0.0234	59	85.5%	14.5%	49
40	0.4250	0.0165	105	74.3%	25.7%	46
50	0.3000	0.0117	146	64.2%	35.8%	41
100	0.1500	0.0059	242	40.7%	59.3%	96
140	0.1060	0.0041	288	29.4%	70.6%	46
170	0.0900	0.0035	312	23.5%	76.5%	24
200	0.0750	0.0029	333	18.4%	81.6%	21
Pan			407	0.2%	99.8%	74

Total Wt of Sample, grams	407	407
Total Wt of Sample (initial), grams	408	
% Error	0.2%	

Summary	
Gravel	0.2%
Sand + Gravel (Coarse)	81.6%
Sand	81.4%
Silt + Clay (Fines)	18.1%
Coarse/Fine Ratio	4.50

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #3

Depth: 9 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	504	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	3	99.4%	0.6%	3
12	1.7000	0.0661	27	94.6%	5.4%	24
30	0.6000	0.0234	119	76.4%	23.6%	92
40	0.4250	0.0165	171	66.1%	33.9%	52
50	0.3000	0.0117	217	56.9%	43.1%	46
100	0.1500	0.0059	314	37.7%	62.3%	97
140	0.1060	0.0041	350	30.6%	69.4%	36
170	0.0900	0.0035	370	26.6%	73.4%	20
200	0.0750	0.0029	387	23.2%	76.8%	17
Pan			501	0.6%	99.4%	114

Total Wt of Sample, grams	501	501
Total Wt of Sample (initial), grams	504	
% Error	0.6%	

Summary	
Gravel	0.6%
Sand + Gravel (Coarse)	76.8%
Sand	76.2%
Silt + Clay (Fines)	22.6%
Coarse/Fine Ratio	3.39

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #3

Depth: 6 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	434	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	1	99.8%	0.2%	1
12	1.7000	0.0661	5	98.8%	1.2%	4
30	0.6000	0.0234	42	90.3%	9.7%	37
40	0.4250	0.0165	74	82.9%	17.1%	32
50	0.3000	0.0117	106	75.6%	24.4%	32
100	0.1500	0.0059	193	55.5%	44.5%	87
140	0.1060	0.0041	236	45.6%	54.4%	43
170	0.0900	0.0035	258	40.6%	59.4%	22
200	0.0750	0.0029	279	35.7%	64.3%	21
Pan			433	0.2%	99.8%	154

Total Wt of Sample, grams	433	433
Total Wt of Sample (initial), grams	434	
% Error	0.2%	

Summary	
Gravel	0.2%
Sand + Gravel (Coarse)	64.3%
Sand	64.1%
Silt + Clay (Fines)	35.5%
Coarse/Fine Ratio	1.81

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #3

Depth: 3 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	554	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.3%	0.7%	4
12	1.7000	0.0661	34	93.9%	6.1%	30
30	0.6000	0.0234	153	72.4%	27.6%	119
40	0.4250	0.0165	218	60.6%	39.4%	65
50	0.3000	0.0117	267	51.8%	48.2%	49
100	0.1500	0.0059	383	30.9%	69.1%	116
140	0.1060	0.0041	429	22.6%	77.4%	46
170	0.0900	0.0035	450	18.8%	81.2%	21
200	0.0750	0.0029	468	15.5%	84.5%	18
Pan			552	0.4%	99.6%	84
Total Wt of Sample, grams			552			552
Total Wt of Sample (initial), grams			554			
% Error			0.4%			

Summary	
Gravel	0.7%
Sand + Gravel (Coarse)	84.5%
Sand	83.8%
Silt + Clay (Fines)	15.2%
Coarse/Fine Ratio	5.57

MECHANICAL SIEVE ANALYSIS

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Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #2

Depth: 9 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	677	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	95	86.0%	14.0%	95
12	1.7000	0.0661	160	76.4%	23.6%	65
30	0.6000	0.0234	263	61.2%	38.8%	103
40	0.4250	0.0165	330	51.3%	48.7%	67
50	0.3000	0.0117	394	41.8%	58.2%	64
100	0.1500	0.0059	555	18.0%	82.0%	161
140	0.1060	0.0041	598	11.7%	88.3%	43
170	0.0900	0.0035	619	8.6%	91.4%	21
200	0.0750	0.0029	632	6.6%	93.4%	13
Pan			677	0.0%	100.0%	45
Total Wt of Sample, grams			677			677
Total Wt of Sample (initial), grams			677			
% Error			0.0%			

Summary	
Gravel	14.0%
Sand + Gravel (Coarse)	93.4%
Sand	79.3%
Silt + Clay (Fines)	6.6%
Coarse/Fine Ratio	14.04

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #2

Depth: 6 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	423	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	7	98.3%	1.7%	7
12	1.7000	0.0661	25	94.1%	5.9%	18
30	0.6000	0.0234	99	76.6%	23.4%	74
40	0.4250	0.0165	137	67.6%	32.4%	38
50	0.3000	0.0117	168	60.3%	39.7%	31
100	0.1500	0.0059	248	41.4%	58.6%	80
140	0.1060	0.0041	282	33.3%	66.7%	34
170	0.0900	0.0035	301	28.8%	71.2%	19
200	0.0750	0.0029	318	24.8%	75.2%	17
Pan			422	0.2%	99.8%	104

Total Wt of Sample, grams	422	422
Total Wt of Sample (initial), grams	423	
% Error	0.2%	

Summary	
Gravel	1.7%
Sand + Gravel (Coarse)	75.2%
Sand	73.5%
Silt + Clay (Fines)	24.6%
Coarse/Fine Ratio	3.06

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #2

Depth: 3 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	605	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.3%	0.7%	4
12	1.7000	0.0661	15	97.5%	2.5%	11
30	0.6000	0.0234	137	77.4%	22.6%	122
40	0.4250	0.0165	206	66.0%	34.0%	69
50	0.3000	0.0117	256	57.7%	42.3%	50
100	0.1500	0.0059	379	37.4%	62.6%	123
140	0.1060	0.0041	436	27.9%	72.1%	57
170	0.0900	0.0035	460	24.0%	76.0%	24
200	0.0750	0.0029	485	19.8%	80.2%	25
Pan			603	0.3%	99.7%	118
Total Wt of Sample, grams			603			603
Total Wt of Sample (initial), grams			605			
% Error			0.3%			

Summary	
Gravel	0.7%
Sand + Gravel (Coarse)	80.2%
Sand	79.5%
Silt + Clay (Fines)	19.5%
Coarse/Fine Ratio	4.11

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #1

Depth: 9 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	460	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	0	100.0%	0.0%	0
12	1.7000	0.0661	8	98.3%	1.7%	8
30	0.6000	0.0234	17	96.3%	3.7%	9
40	0.4250	0.0165	29	93.7%	6.3%	12
50	0.3000	0.0117	54	88.3%	11.7%	25
100	0.1500	0.0059	119	74.1%	25.9%	65
140	0.1060	0.0041	150	67.4%	32.6%	31
170	0.0900	0.0035	171	62.8%	37.2%	21
200	0.0750	0.0029	208	54.8%	45.2%	37
Pan			455	1.1%	98.9%	247

Total Wt of Sample, grams	455	455
Total Wt of Sample (initial), grams	460	
% Error	1.1%	

Summary	
Gravel	0.0%
Sand + Gravel (Coarse)	45.2%
Sand	45.2%
Silt + Clay (Fines)	53.7%
Coarse/Fine Ratio	0.84

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #1

Depth: 5 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	622	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.7%	0.3%	2
12	1.7000	0.0661	20	96.8%	3.2%	18
30	0.6000	0.0234	137	78.0%	22.0%	117
40	0.4250	0.0165	205	67.0%	33.0%	68
50	0.3000	0.0117	262	57.9%	42.1%	57
100	0.1500	0.0059	406	34.7%	65.3%	144
140	0.1060	0.0041	457	26.5%	73.5%	51
170	0.0900	0.0035	488	21.5%	78.5%	31
200	0.0750	0.0029	514	17.4%	82.6%	26
Pan			621	0.2%	99.8%	107
Total Wt of Sample, grams			621			621
Total Wt of Sample (initial), grams			622			
% Error			0.2%			

Summary	
Gravel	0.3%
Sand + Gravel (Coarse)	82.6%
Sand	82.3%
Silt + Clay (Fines)	17.2%
Coarse/Fine Ratio	4.80

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS Antelope Valley

Job No.: 27-6830

Sample ID: Test Pit #1

Depth: 3 ft

Tested By: LK

Test Date: 30-May-02

Wt. of dry sample + container		grams
Wt. of container		grams
Wt. of dry sample	482	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.6%	0.4%	2
12	1.7000	0.0661	13	97.3%	2.7%	11
30	0.6000	0.0234	63	86.9%	13.1%	50
40	0.4250	0.0165	105	78.2%	21.8%	42
50	0.3000	0.0117	144	70.1%	29.9%	39
100	0.1500	0.0059	247	48.8%	51.2%	103
140	0.1060	0.0041	295	38.8%	61.2%	48
170	0.0900	0.0035	322	33.2%	66.8%	27
200	0.0750	0.0029	342	29.0%	71.0%	20
Pan			480	0.4%	99.6%	138

Total Wt of Sample, grams	480	480
Total Wt of Sample (initial), grams	482	
% Error	0.4%	

Summary	
Gravel	0.4%
Sand + Gravel (Coarse)	71.0%
Sand	70.5%
Silt + Clay (Fines)	28.6%
Coarse/Fine Ratio	2.48

Appendix D
Boring Investigation Results

Start (ft,bgs)	End (ft,bgs)	Expected K (ft/dy) TH-2	Expected K (ft/dy) TH-3	Expected K (ft/dy) TH-4	
0	10				
10	20				
20	30				
30	40				
40	50		13		
50	60				
60	70				
70	80	15			
80	90				
90	100	29			
100	110				
110	120			32	
120	130				
130	140				
140	150	27	9		
150	160				
160	170		20		
170	180	39		31	
180	190				
190	200			26	
200	210		23		
210	220			34	
220	230				
230	240				
240	250		8		
250	260				
260	270	31		26	
270	280				
280	290			32	
290	300				
300	310				
310	320		26		
320	330				
330	340				Below water table
340	350				
350	360				
360	370	17		13	
370	380		31		
380	390				
390	400				
400	410	31			
410	420				
420	430		9		
430	440				
440	450				
450	460				
460	470				
470	480	32		23	
480	490				
490	500				
500	510				

	TH-2	TH-3	TH-4	All
Min	15	8	13	8
Average	27	17	27	24
Geomean	26	15	26	22
Max	39	31	34	39
Std. Dev.	8	9	7	9
N	8	8	8	24

Grouped	Above WT	Below WT
Min	8	9
Average	25	22
Geomean	23	20
Max	39	32
Std. Dev.	9	9
N	17	7

Code	Boring	Description	Depth (ft, bgs)	Sand (%)	Silt (%)	Clay (%)	Log Ks (cm/dy)	Log Ks_u (uncertainty)	Theta_r (residual water content)	Theta_r_u (uncertainty)	Theta_s (saturated water content)	Theta_s_u (uncertainty)	Alpha	Alpha_u	Npar	Npar_u	K (ft/dy)	Specific Yield
7	TH-2	TH-2 75-80 FT	78	91.2	8.6	0.2	2.649519	0.118824204	0.04214858	0.004589015	0.387504875	0.009270145	-1.383857	0.059527	0.464897	0.02133	15	35%
6	TH-2	TH-2 95-100 FT	98	95.94	4.06	0	2.939255	0.089525254	0.047038759	0.004596492	0.382558283	0.008123809	-1.426205	0.045054	0.568769	0.019976	29	34%
5	TH-2	TH-2 140-145	143	95.71	4.28	0.1	2.923097	0.090220818	0.046951702	0.004497754	0.382798037	0.007892012	-1.425028	0.044654	0.562526	0.019473	27	34%
4	TH-2	TH-2 175-180 FT	178	98.49	1.51	0	3.078463	0.088082367	0.049515701	0.004990997	0.378916753	0.008569761	-1.449443	0.055292	0.617872	0.026009	39	33%
3	TH-2	TH-2 260-265 ft	263	96.62	3.38	0	2.977554	0.085890412	0.047738296	0.004648631	0.381666325	0.008040147	-1.432464	0.045	0.582302	0.020753	31	33%
2	TH-2	TH-2 365-370 FT	368	92.04	7.97	0	2.704312	0.119633212	0.042675825	0.004701102	0.38721551	0.009484575	-1.387815	0.058806	0.485163	0.021416	17	34%
1	TH-2	TH-2 400-405 FT	403	96.47	3.52	0	2.969458	0.086349457	0.04759618	0.004633613	0.381837598	0.008057261	-1.431258	0.044884	0.57943	0.020547	31	33%
8	TH-2	TH-2 470-475 FT	473	96.72	3.27	0	2.983396	0.085311141	0.047849225	0.00465774	0.381502667	0.008040113	-1.433544	0.045147	0.584346	0.020921	32	33%
15	TH-3	TH-3 45-50 FT	48	90.39	9.61	0	2.600731	0.131389753	0.040746808	0.004903753	0.38899462	0.010299727	-1.370894	0.064986	0.448145	0.022494	13	35%
14	TH-3	TH-3 140-145 FT	143	87.26	12.74	0	2.413512	0.151917606	0.037090345	0.005501922	0.392280707	0.012027735	-1.339008	0.075458	0.378869	0.023616	9	36%
13	TH-3	TH-3 165-170 FT	168	93.44	6.55	0	2.79172	0.108614956	0.044310602	0.004593443	0.385565605	0.008888954	-1.402321	0.053127	0.516283	0.020307	20	34%
12	TH-3	TH-3 205-210 FT	208	94.37	5.63	0	2.847675	0.1014234	0.045344909	0.004565695	0.384499671	0.008538824	-1.411304	0.049388	0.536227	0.019783	23	34%
11	TH-3	TH-3 237-245 FT	241	87.18	12.8	0.2	2.402254	0.149666799	0.037228262	0.005420461	0.392284436	0.011513082	-1.339559	0.074327	0.374396	0.024018	8	36%
10	TH-3	TH-3 315-320 FT	318	95.37	4.63	0	2.90651	0.093518999	0.046435403	0.004572255	0.383279348	0.008244749	-1.420873	0.046132	0.557157	0.019683	26	34%
9	TH-3	TH-3 370-375 FT	373	96.7	3.3	0	2.982004	0.085576483	0.047818998	0.004656662	0.381558662	0.008035759	-1.433194	0.045104	0.583872	0.020878	31	33%
16	TH-3	TH-3 425-430 FT	428	87.38	12.62	0	2.420203	0.151252779	0.037227545	0.005475181	0.392157439	0.011957596	-1.34018	0.075067	0.381441	0.023588	9	35%
22	TH-4	TH-4 110-115 FT	113	96.77	3.24	0	2.985607	0.085522218	0.047879229	0.004665143	0.381492934	0.008028787	-1.433666	0.045215	0.585158	0.020985	32	33%
21	TH-4	TH-4 175-180 FT	178	96.76	3.24	0.1	2.98209	0.084753071	0.048029771	0.004577835	0.38145108	0.007793672	-1.434588	0.044818	0.583382	0.020558	31	33%
20	TH-4	TH-4 190-195 FT	193	95.11	4.89	0	2.891381	0.095508882	0.046155567	0.004566381	0.38360162	0.008312186	-1.418412	0.046849	0.551782	0.019643	26	34%
19	TH-4	TH-4 210-215 FT	213	97.32	2.68	0	3.016097	0.084207621	0.048431756	0.004735021	0.380700163	0.008054975	-1.438824	0.046845	0.595876	0.022108	34	33%
18	TH-4	TH-4 260-265 FT	263	95.34	4.66	0	2.90477	0.093744547	0.046403256	0.004571419	0.383316731	0.008252168	-1.42059	0.046209	0.55654	0.019676	26	34%
17	TH-4	TH-4 285-290 FT	288	96.86	3.12	0.2	2.984908	0.08415284	0.048302677	0.004508877	0.381232061	0.007643213	-1.436694	0.045455	0.583837	0.020509	32	33%
24	TH-4	TH-4 360-365 FT	363	90.58	9.43	0	2.61241	0.130224998	0.0409608	0.004878475	0.388819013	0.010198865	-1.372704	0.064296	0.452339	0.022421	13	35%
23	TH-4	TH-4 75-80 FT	478	94.57	5.41	0.2	2.85334	0.098689066	0.045863871	0.004399643	0.384159391	0.00795765	-1.415072	0.047722	0.537287	0.019469	23	34%

Layne GeoSciences

a Division of Layne Christensen Company

11001 Etiwanda Avenue, Fontana, CA 92337 909/390-2833 909/390-6097 FAX

EXPLORATORY TEST HOLE DATA
VAN DAM FARM TEST HOLES 2, 3, AND 4
ANTELOPE VALLEY, CALIFORNIA

PREPARED FOR:

WESTERN DEVELOPMENT AND STORAGE
5700 WILSHIRE BLVD., STE. 330
LOS ANGELES, CA 90036

LGS PROJ. NO. 27-7897
24 OCTOBER 2003

Prepared by:

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LGS

EXPLORATORY TEST HOLE DATA
VAN DAM FARM TEST HOLES 2, 3, AND 4
ANTELOPE VALLEY, CALIFORNIA

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EXPLORATORY TEST HOLE DATA
VAN DAM FARM TEST HOLES 2, 3, AND 4
ANTELOPE VALLEY, CALIFORNIA

Layne GeoSciences (LGS), a division of Layne Christensen Company, is pleased to provide ***Western Development and Storage (WDS)*** with soil boring logs, water quality analysis results, borehole geophysical logs, as well as sieve analyses for the recently completed exploratory test holes drilled at Van Dam Farm, Antelope Valley, California. The purpose of the test holes was to gather information about the geologic and hydrogeologic conditions underlying the proposed project area.

1. *INTRODUCTION*

Three exploratory test holes (Figure 1), labeled Test Holes 2-4, were drilled in the proposed project area using an IR 60 dual wall reverse air rig using a 5.25 inch diameter bit. Test hole 1, located further to the east, was not drilled due to land access restrictions. Test hole permits (Appendix) were obtained from Kern County prior to the initiation of drilling activity. Formation samples were collected at five-foot (ft) intervals and described by the field geologist. Groundwater samples were collected from the regional aquifer for water quality analysis by a laboratory certified by the State of California. The water samples were analyzed for general mineral and physical characteristics.

Upon completion of lithologic and water quality sampling activities at each test hole, the borehole was filled with a bentonite mixture to stabilize the formations in preparation for performing borehole geophysical logging. The suite of geophysical logs recorded for each test hole included: Short and Long Normal Resistivities, Guard Resistivity, Single Point Resistance, Spontaneous Potential, and Natural Gamma.

Soil cuttings and water produced during the drilling process were spread on the ground near each test hole location.

2. *SUMMARY*

The following sections include summaries of the subsurface conditions encountered at each of the test hole locations. Lithologic details, borehole geophysical logs, water quality analytical data, and mechanical sieve analyses results are contained in the appendix of this report.

2.1 TEST HOLE 2

This test hole was drilled on 28-30 July 2003 to a total depth of 478 feet near the intersection of 160th Street and Holiday Avenue.

2.1.1. LITHOLOGY

The general stratigraphy consisted of possible fill deposits (0-5 feet) with alluvium to the total depth of the hole. The alluvium is predominately a fine to coarse-grained sand with interbedded gravels to depths of about 250 feet below ground surface (bgs). Underlying this is a finer silty, sand formation with interbedded thin clay lenses to the total depth of the borehole.

Borehole geophysical data were collected to a depth of 370 ft BGS with data from the deeper formations unobtainable due to borehole collapse.

Sieve analyses indicate that upper, coarser-grained formations can be texturally classified as gravelly sands with the deeper formations (i.e., greater than about 250 ft BGS) are generally classified as silty sands.

2.1.2. GROUNDWATER

Groundwater was encountered at an approximate depth of 358 ft. below ground surface (BGS) with minimal production after circulation of each drill rod. Static groundwater level in the test hole could not be determined with any accuracy due to plugging of the drill bit by the fine-grained formation material.

2.1.3. WATER QUALITY

Previous groundwater sampling from the Field Well[1] south of the borehole indicates good water quality as well as good production from saturated portions of the alluvium. Copies of the laboratory data sheets are included as an appendix to this report.

2.2 TEST HOLE 3

This test hole was drilled on 24-25 August 2003 to a total depth of 438 feet near the intersection of 170th Street between Willow Avenue and Holiday Avenue.

2.2.1. LITHOLOGY

The general stratigraphy (Reference: Soil Boring Log and E-log) consists of possible fill deposits (0-5 feet) with alluvium to the total depth of the hole. The alluvium is predominantly a fine to coarse-grained sand with interbedded gravels to depths of about 220 feet below ground surface (bgs). Underlying this is a silty fine to medium-grained sand formation with interbedded thin clay lenses to the total depth of the borehole.

Borehole geophysical data were collected to a depth of 388 ft BGS with data from the deeper formation unobtainable due to borehole collapse.

Sieve analyses indicate that upper, coarser-grained formations can be texturally classified as gravelly sands with the deeper formations (i.e., greater than about 250 ft BGS) are generally classified as silty sands.

2.2.2. GROUNDWATER

Groundwater was encountered at an approximate depth of 338 ft. BGS with minimal production after circulation after each drill rod. Static groundwater level in the test hole was sounded through the inner barrel of the drill tube and measured at 352 feet bgs. Previous measurements throughout drilling did not indicate water until a suspected confining system was penetrated.

2.2.3. WATER QUALITY

Groundwater sampling from the test hole indicates good water quality as well as good production from saturated alluvium. Copies of the laboratory data sheets are included as an appendix to this report.

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[1] Layne GeoSciences, June 2003, unpublished water quality analyses.

2.3 TEST HOLE 4

This test hole was drilled on 31 July - 1 August 2003 to a total depth of 398 feet near the intersection of 155th Street and Willow Avenue.

2.3.1. LITHOLOGY

The general stratigraphy (Reference: Soil Boring Log, Sieve Analysis, and E-log) consists of possible fill deposits (0-10 feet) with alluvium to the total depth of the hole. The alluvium is predominately a fine to coarse-grained sand with interbedded gravels to depths of about 220 feet below ground surface (bgs). Underlying this is a finer silty, sand formation with interbedded thin clay lenses to the total depth of the borehole.

Borehole geophysical data were collected to a depth of 372 ft BGS with data from the deeper formation unobtainable due to borehole collapse.

Sieve analyses indicate that upper, coarser-grained formations can be texturally classified as gravelly sands with the deeper formations (i.e., greater than about 250 ft BGS) are generally classified as silty sands.

2.3.2. GROUNDWATER

Groundwater was encountered at an approximate depth of 300 ft. below ground surface (BGS) with minimal production after circulation of each drill rod. Static groundwater level in the test hole was sounded through the inner barrel of the drill tube at 331 feet bgs. The Station Well (about 300 feet north of test hole) has reportedly produced irrigation water at a significant, consistent rate in the recent past.

2.3.3. WATER QUALITY

Groundwater sampled from the test hole was delivered to an analytical laboratory; the analytical results are pending. Previous sampling[2] from the Station Well (about 300 feet north of test hole) showed good water quality. Copies of the laboratory data sheets are included in the appendix to this report.

---

[2] Layne GeoSciences, June 2003, unpublished water quality analyses.

3. *DISCUSSION*

The purpose of the test holes was to gather information about the geologic and hydrogeologic conditions underlying the proposed project area. The following sections provide discussions of these conditions based on the data from the exploratory boreholes.

3.1 GEOLOGY

The geologic materials encountered in the exploratory test holes were consistent with the regional alluvial depositional environment. In general, the geologic sequences consist of interbedded sands, gravels, silts, and to a lesser degree, clays. The upper 200-225 ft of each test hole was coarser-grained than the lower portions, although the overall textural classification of the samples from each test hole can be classified as predominately sand (Figure 2). The clay content of the sediments is not perceived to be great enough to pose significant impedence to the percolation of water. This conclusion should be verified with long-term infiltration tests conducted at an instrumented (e.g., sonic/neutron access holes, pressure transducers/data loggers on nearby wells) test location to document the downward movement of water.

3.2 GROUNDWATER

The regional groundwater aquifer was encountered at depths of 376 – 390 ft BGS and is considered to be confined, or at least semi-confined, with the piezometric surface being up to about 24 ft higher than the top of the aquifer when confined.

3.3 WATER QUALITY

The overall quality of the groundwater encountered in the test holes is excellent. A summary of the common analytes from agricultural areas is presented below. Complete laboratory data sheets are contained in the appendix.

Analyte	Van Dam #3-438 ft	Van Dam #4-358 ft
Arsenic (dissolved), ug/L	ND	1.4
Boron (dissolved), ug/L	ND	ND
Iron (dissolved), ug/L	ND	ND
Manganese (dissolved), ug/L	ND	25

Analyte	Van Dam #3-438 ft	Van Dam #4-358 ft
Nitrate –NO3, mg/L	9.0	11
Hardness (as CaCO3), mg/L	130	180
Total Dissolved Solids, mg/L	200	240
pH	8.05	7.84
Langlier Index	0.37	0.16

4. RECOMMENDATIONS

The geologic and hydrogeologic data gained from the test holes did not identify subsurface conditions detrimental to the development of a groundwater water storage facility. Based on these preliminary investigations, ***LGS*** would suggest that the following activities be performed to further confirm the suitability of the site for its intended use:

- *Perform a long-term infiltration test.* The test could be designed to use one of the existing "tailwater collection" ponds or irrigation water ponds on the property. Water for the test could be supplied from an existing irrigation well. Nearby wells should be monitored for changes in groundwater levels during pumping and infiltration events. The movement of the wetting front downward from the base of the infiltration pond could be monitored via the installation of sonic or neutron access tubes adjacent to the pond. These tubes would allow a borehole sonic tool or neutron tool to make successive surveys of the formations beneath the pond. Changes in the sonic or neutron response would be the result of changes in the moisture content of the surrounding sediments.
- *Determine the aquifer characteristics beneath the project site.* Existing irrigation wells should be characterized with respect to well construction (e.g., total depth, perforated interval), well hydraulics (e.g., specific capacity v. pumping rate curves, well efficiencies), aquifer hydraulic properties (e.g., transmissivity, storativity). If well construction diagrams are not available, then the total depths and perforated intervals could be determined from video surveys. Small diameter sounding tubes could be installed to permit the installation of pressure transducers with data loggers to record water level fluctuations during pumping and recovery periods. These data are used to determine the specific capacity of a well. Aquifer transmissivity and storativity values could be calculated from the drawdown and recovery data, as well. The installation of the sounding tube also permits spinner flowmeter surveys to be performed. Flowmeter surveys are useful in determining the response of an aquifer to varying levels of stress (i.e., pumping rates). These data assist in selecting the depth at which a pump should be set to maximize flow.

5. *LIMITATIONS OF INVESTIGATION*

This investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by experienced professionals practicing in this or similar locations. No warranty, expressed or implied, is made as to the conclusions and professional advice included in the referenced reports.

The samples taken and used for testing and the observations made are believed representative of the entire project area; however, environmental, soil, geologic, and hydrogeologic conditions can vary significantly between borings, test points, and surface outcrops. The interpretations and conclusions contained in the referenced reports are based on the results of laboratory tests and analyses intended to detect the presence and concentration of certain chemical constituents in samples collected from the subject property. Such testing and analysis have been conducted by an independent laboratory which is certified by the State of California to conduct such test analysis and which uses methodologies mandated by the Environmental Protection Agency in the performance of such testing and analysis. LGS has no involvement in, or control over, such testing and analysis and has no nonlaboratory means of confirming the accuracy of such laboratory results. LGS, therefore, disclaims any responsibility for any inaccuracy in such laboratory results.

The interpretations and conclusions contained in the referenced reports are based on our review of the referenced materials and our field investigations described therein. As in most projects, conditions revealed by additional subsurface investigations may be at variance with preliminary findings. If this occurs, experienced hydrogeological professionals must evaluate the changed conditions and designs adjusted as required or alternate design and plans recommended.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can and do occur with the passage of time, whether they be due to natural processes or the work of people on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of the referenced reports may be invalidated wholly or partially by changes outside of our control. Therefore, the referenced reports are subject to review and revision as changed conditions are identified.

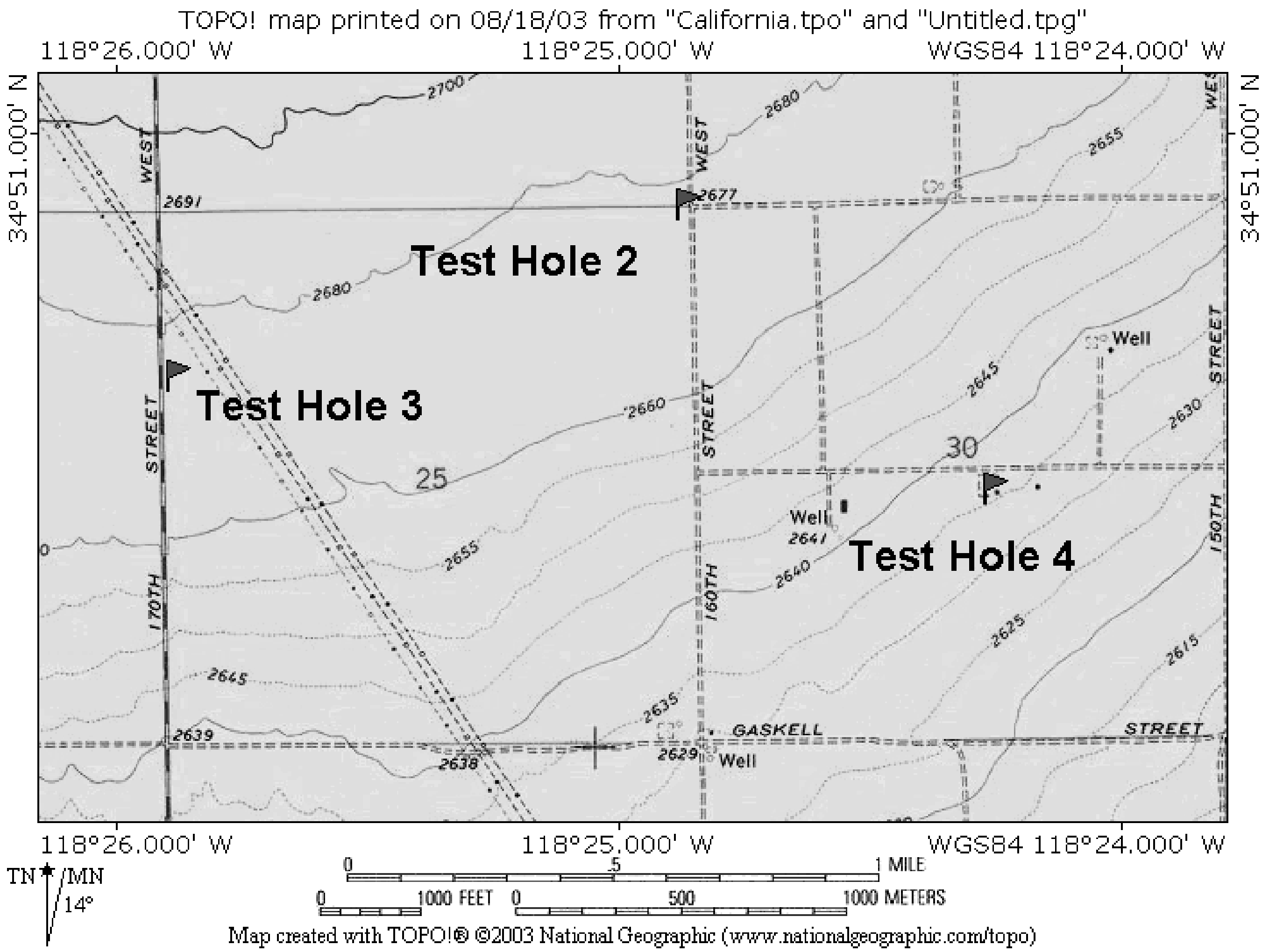

Figure 1: Site Map

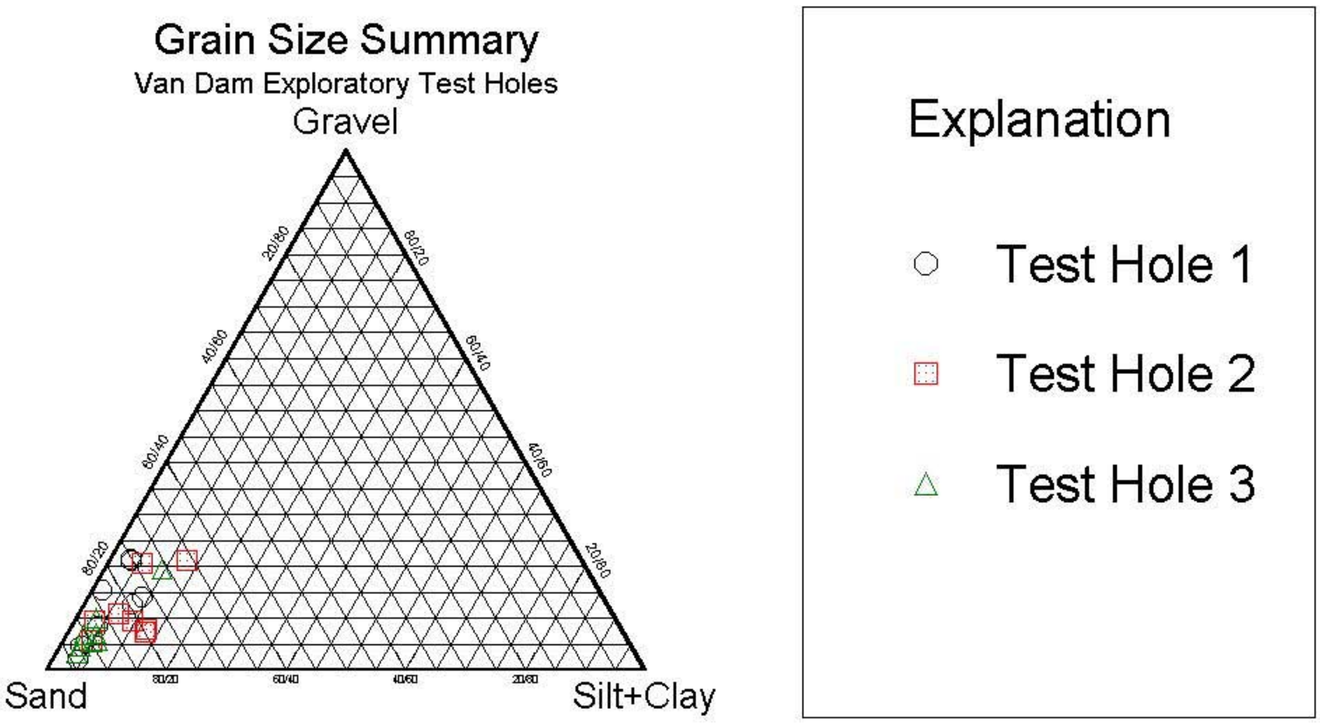

Figure 2: Mechanical Sieve Analyses

WELL PERMITS

SOIL BORING LOGS

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
0–5			Silty fine to medium-grained sand with trace clay content.	
5–10			No cuttings, blowing around annulus.	
10–15			Medium to coarse-grained sand with 10% fine gravel content.	
15–20			No cuttings. Blowing up around annulus.	
20–25			Medium to coarse-grained sand with 10% gravel content.	
25–30			Medium to coarse-grained sand with5% gravel content and trace clay content.	
30–33			Medium to coarse-grained sand with 15% gravel content.	
33–40			Fine to medium-grained sand with trace gravel and trace clay content.	
40–45			Medium to coarse-grained sand with moderate gravel and clay content.	
45–50			Fine to coarse-grained sand with 15% gravel content.	

Layne GeoSciences
Boring Log

BORING NUMBER : TH-3
SHEET 2 of 9

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to medium-grained sand.	
55			Fine to coarse-grained sand.	
60			Silty fine to medium-grained sand.	
65			Silty fine to medium-grained sand with interbedded fine gravel lenses.	
70				
75			Silty fine to medium-grained sand.	
80			Silty fine to medium-grained sand with trace coarse sand and gravel content.	
85			Silty fine to medium-grained sand with trace gravel content.	
90				
95			Medium-grained sand with 20% gravel content.	
100				

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
100–105			Silty fine to coarse-grained sand.	
105–110			Medium to coarse-grained sand.	
110–125			Silty medium to coarse-grained sand with trace gravel content.	
125–130			Silty fine-grained sand with trace clay and trace gravel content	
130–140			Silty fine-grained sand.	
140–145			Silty fine-grained sand with trace clay and trace gravel content.	
145–150			Silty fine-grained sand with interbedded clay.	

Layne GeoSciences
Boring Log

BORING NUMBER : TH-3

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897

DRILLING METHOD : Reverse Dual Wall Air

DRILLING CONTRACTOR : Layne Christensen Co.

LOGGER : LK

LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003

LAT: N 34* 50. 610'

LONG: W 118* 25. 910'

GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
155				
160			Clayey silty fine-grained sand.	
165			Silty fine-grained sand.	
170			Medium to coarse-grained sand with trace clay content.	
175				
180			Fine to medium-grained sand with trace silty gravel.	
185			Fine-grained sand with trace silty gravel.	
190			Silty fine-grained sand with trace clay content.	
195				
200				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-3
SHEET 5 of 9

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
205, 210, 215			Silty medium to coarse-grained sand with trace fine gravel content.	
215–220			Silty medium to coarse-grained sand with 20% gravel content.	
220–225			Silty medium to coarse-grained sand.	
225, 230, 235			Clayey silty fine to coarse-grained sand with interbedded gravel lenses.	
240			Sandy silty clay.	
245, 250			Silty fine-grained sand.	

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
255			Silty medium to coarse-grained sand with trace gravel content.	
260			Silty medium to coarse-grained sand with trace gravel content and interbedded clay laminae.	
265			Silty fine to medium-grained sand interbedded clay lenses.	
270			Silty medium to coarse-grained sand with trace gravel content.	
275			Silty medium to coarse-grained sand.	
280			Silty medium to coarse-grained sand with trace gravel content.	07/25/2003 Sounded borehole through inner tube with bit at 258' bgs no water encountered.
285			Silty medium to coarse-grained sand.	
290			Silty medium to coarse-grained sand with interbedded clay lenses.	
295			Silty medium to coarse-grained sand with trace gravel content.	No water after circulation.
300				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-3

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty medium-coarse-grained sand with trace gravel content and interbedded clay lenses.	
305			Silty medium to coarse-grained sand with trace gravel content.	
310, 315, 320			Silty fine to coarse-grained sand with interdedded clay lenses.	No water after circulation.
325			Medium to coarse-grained sand with 10% gravel content.	
330, 335			Medium to coarse-grained sand with trace silt and trace gravel.	Slight water after circulation <1/2gpm.
340, 345, 350			Medium to coarse-grained sand with trace gravel with interbedded clay lenses.	

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
355			Medium to coarse-grained sand with trace gravel content.	Slight water after circulation <1/2gpm.
360			Medium to coarse-grained sand with 10% gravel content.	
365				
370			Medium to coarse-grained sand with intebedded clay lenses.	
375				Little to no water after circulation.
380			Silty fine to coarse-grained sand with trace gravel content.	
385			Silty fine to coarse-grained sand with trace gravel and 40% clay content.	
390			Silty fine to coarse-grained sand with trace gravel content.	
395			Medium to coarse-grained sand with trace gravel and trace silt content.	No water after circulation.
400				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-3

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 170th St. Van Dam Farm

DATE: 7/24/2003 thru 7/25/2003
LAT: N 34* 50. 610'
LONG: W 118* 25. 910'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Coarse-grained sand and gravel.	
405			Fine to coarse-grained sand and gravel with trace silt content.	
410				
415				
			Clay.	Slight water after circulation < 1/4gpm
420			Silty fine to coarse-grained sand with interbedded clay.	
425				
430			Silty sandy clay.	SWL at 352' after ~1 hr. measured thru inner drill tube with bit at 438' bgs.
435				Water Sample taken Temp.: 28.5 Celcius, pH: 8.7, Cond.: 310 ms
440				TD at 438ft. bgs with increase in water content at last 1-2ft. E-log and abandon as per insructions.
445				
450				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-2

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897

DRILLING METHOD : Reverse Dual Wall Air

DRILLING CONTRACTOR : Layne Christensen Co.

LOGGER : LK

LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003

LAT: N 34* 50. 875'

LONG: W 118* 24. 875'

GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
0–5			Fine-grained sand with trace silt content.	07/28/2003
5–10			Fine to medium-grained sand.Collected through annulus blow out.	
10–15			Fine to coarse-grained sand. Collected through annulus blow out.	
15–20			Fine to medium-grained sand.Collected through annulus blow out.	
20–25			Fine to medium-grained sand with trace gravel content. Collected through annulus blow out.	
25–35			Silty fine to medium-grained sand. Collected through annulus blow out.	
35–40			Gravelly silty fine to medium-grained sand.Interbedded clay lenses.	
40–45			Silty fine to medium-grained sand.	
45–50			Sandy gravel.Predominantly gravel.	

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Boring Log

BORING NUMBER : TH-2

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
51–65			Fine to coarse-grained sand.	
65–70			Fine to coarse-grained sand with 15% gravel content.	
70–75			Fine to coarse-grained sand with interbedded clay lenses.	
75–80			Silty fine-grained sand with trace coarse material.	
80–90			Silty fine to coarse-grained sand with trace gravel content.	
90–100			Silty fine to coarse-grained sand.	

Depth scale: 55, 60, 65, 70, 75, 80, 85, 90, 95, 100

Layne GeoSciences
Boring Log

BORING NUMBER : TH-2

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
105, 110			Medium to coarse-grained sand with 10-15% gravel content.	
115			Coarse-grained sand and gravel30-40% with trace silt content.	
120			Coarse-grained sand and gravel with trace clay at 124ft.	
125, 130, 135, 140			Fine to coarse-grained sand with trace gravel content.	
145			Silty clayey fine to coarse-grained sand.	
150				

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Fine to coarse-grained sand with trace gravel content.	
155			Silty clayey fine to medium-grained sand.	
160			Silty fine to coarse-grained sand.	
165				
170			Silty fine to coarse-grained sand with trace gravel content.	
175			Silty fine to coarse-grained sand.	
180			Silty fine to coarse-grained sand with trace clay content.	
185			Silty fine to coarse-grained sand with trace gravel.	
190			Silty coarse grained-sand and gravel.	
195			Silty coarse-grained sand and gravel.	
200				

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
205			Fine to coarse-grained sand and trace gravel.	
210			Silty fine to medium-grained sand.	
215			DRILL MUD, No Cuttings.Stop adding mud around annulus.	
220			Silty sandy clay.	
225				
230			Fine to coarse-grained sand with trace gravel content.	
235			Medium to coarse-grained sand with trace gravel content.	
240			Coarse-grained sand and gravel.	
245			Medium to coarse-grained sand and gravel.	
250				

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to coarse-grained sand with interbedded gravel lenses.	
255			Silty fine to medium-grained sand with trace clay content.	
260			Silty fine to medium-grained sand with interbedded gravels.	
265			Silty medium to coarse-grained sand.	
270				
275			Silty medium to coarse-grained sand with interbedded clay.	07/29/2003
280			Fine to coarse-grained sand coarsing down.	Sounded well at 0718, no water.
285			Alternating fine to coarse sand with interbedded gravel.	
290			Silty fine to coarse-grained sand with trace gravel content.	
295			Fine to coarse-grained sand with interbedded clay.	
300				

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to medium-grained sand.	
305			Silty fine to medium-grained sand with 10-15% gravel content.	
310			Silty fine to coarse-grained sand.	
315			Silty fine to medium-grained sand with trace gravel content.	
320			Medium to coarse-grained sand with trace gravel content.	
325			Silty fine to coarse-grained sand with trace gravel and trace clay content.	
330			Silty gravelly medium to coarse-grained sand.	
335			Silty fine to coarse-grained sand.	
340			Silty fine-grained sandy clay.	
345			Fine to coarse-grained sand with interbedded silty clay.	
350				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-2
SHEET 8 of 10

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
355			Medium to coarse-grained sand with 15% gravel content.	Producing minimal water after circulation.<1/2 gpm
360			Clay with interbedded fine to medium-grained sand.	
365			Medium-grained sand with interbedded clay.	
370			Silty fine to coarse-grained sand with trace gravel content.	
375				Dry after circulation.
380			Fine to medium-grained sand with interbedded clay lenses.	
385			Fine to coarse-grained sand with 10% gravel content.	
390			Fine to medium-grained sand with interbedded silty gravel lenses.	
395				
400				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-2

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897

DRILLING METHOD : Reverse Dual Wall Air

DRILLING CONTRACTOR : Layne Christensen Co.

LOGGER : LK

LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003

LAT: N 34* 50. 875'

LONG: W 118* 24. 875'

GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Fine to coarse-grained sand and trace gravel with interbedded silty clay.	
405			Fine to coarse-grained sand with interbedded silty clay.	
410			Fine to coarse-grained sand with 15% gravel content and interbedded silty clay.	
415				
420			Silty gravelly fine to coarse-grained sand.	
425			Silty fine-grained sand.	
430			Silty fine-grained sand with interbedded gravel lenses.	
435			Silty fine to coarse-grained sand.	Making slight water after circulation. 07/30/2003
440			Medium to coarse-grained sand with trace gravel and trace clay content.	Tagged SWL at 390ft.bgs 7/31/03 at 0712 through inner drill tube. Driller believes bit is plugged with fines making uncertain the actual static water level.
445			Fine to coarse-grained sand with trace clay and trace gravel.	
450				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-2
SHEET 10 of 10

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 160th St. and Holiday Ave.

DATE: 7/28/2003 thru 7/30/2003
LAT: N 34* 50. 875'
LONG: W 118* 24. 875'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
455			Fine to coarse-grained sand with trace gravel content.	
460			Gravelly fine to coarse-grained sand.	
465			Silty fine to coarse-grained sand with trace gravel content.	
470			Silty fine to coarse-grained sand with interbedded gravel lenses.	
475				
480				TD at 478' bgs. E-log and abandon hole as per instructions.
485				
490				
495				
500				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897

DATE: 7/31/2003 thru 8/1/2003

DRILLING METHOD : Reverse Dual Wall Air

LAT: N 34* 50. 404'

DRILLING CONTRACTOR : Layne Christensen Co.

LONG: W 118* 24. 273'

LOGGER : LK

GROUND SURFACE ELEVATION (ft msl) : NA

LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
0–5			Silty fine-grained sand hard packed with secondary leaching present.	07/31/2003
5–10			Silty fine-grained sand with interbedded fine gravel.	
10–20			Silty fine grained sand.	
20–35			Fine-grained sand with 20% gravel content.	
35–45			Silty fine to medium-grained sand with 10% gravel content.	
45–50			Silty fine-grained sand with trace clay and trace gravel content.	

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4
SHEET 2 of 8

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DATE: 7/31/2003 thru 8/1/2003
DRILLING METHOD : Reverse Dual Wall Air
LAT: N 34* 50. 404'
DRILLING CONTRACTOR : Layne Christensen Co.
LONG: W 118* 24. 273'
LOGGER : LK
GROUND SURFACE ELEVATION (ft msl) : NA
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty very fine-grained sand with trace clay content.	
55				
60			Clayey silty fine to medium-grained sand.	
65			Silty fine to coarse-grained sand.	
70				
75			Silty fine to coarse-grained sand with trace clay content.	
80			Silty fine to coarse-grained sand with trace gravel content.	
85				
90			Silty fine to coarse-grained sand with trace clay content.	
95			Fine to coarse-grained sand with interbedded clay lenses.	
100				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DATE: 7/31/2003 thru 8/1/2003
LAT: N 34* 50. 404'
LONG: W 118* 24. 273'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine-grained sand.	
105			Silty fine to coarse-grained sand.	
110			Silty fine to coarse-grained sand with trace gravel content.	
115			Silty fine to coarse-grained sand with trace gravel and trace clay content.	
120			Silty fine to coarse-grained sand with trace gravel content.	
125			Fine to coarse-grained sand with 15% gravel content.	
130			Silty fine to coarse-grained sand.	
135			Silty fine to coarse-grained sand with interbedded gravel lenses.	
140			Silty fine to coarse-grained sand.	
145				
150				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DATE: 7/31/2003 thru 8/1/2003
LAT: N 34* 50. 404'
LONG: W 118* 24. 273'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to coarse-grained sand with interbedded clay lenses.	
155			Silty fine to coarse-grained sand.	
160				
165				
170			Silty fine to coarse-grained sand with interbedded clay.	
175			Silty fine to coarse-grained sand.	
180			Silty fine to medium-grained sand with trace clay content.	
185			Silty fine to coarse-grained sand.	
190			Silty fine to coarse-grained sand with interbedded clay lenses.	
195				
200				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4
SHEET 5 of 8

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DATE: 7/31/2003 thru 8/1/2003
LAT: N 34* 50. 404'
LONG: W 118* 24. 273'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to medium-grained sand with trace gravel content.	
205			Silty fine to medium-grained sand with trace clay content.	
210				
215			Silty fine to coarse-grained sand.	
220			Silty fine to coarse-grained sand with clay laminae at 223ft.	
225			Silty fine to coarse-grained sand with trace clay content.	
230			Silty medium to coarse-grained sand with trace clay content.	
235				
240			Silty fine to coarse-grained sand with interbedded clay lenses.	
245			Silty fine to coarse-grained sand.	
250				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4
SHEET 6 of 8

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DATE: 7/31/2003 thru 8/1/2003
LAT: N 34* 50. 404'
LONG: W 118* 24. 273'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
255			Silty fine to coarse-grained sand with interbedded clayey gravel lenses.	
260			Clay with interbedded silty fine to medium-grained sand.	
265			Silty fine to coarse-grained sand.	
270			Silty medium to coarse-grained sand with trace gravel content.	
275			Silty fine to coarse-grained sand with trace gravel content.	
280			Silty clay with fine-grained sand content.	
285			Silty fine to coarse-grained sand with trace gravel content.	
290			Silty fine to coarse-grained sand.	
295			Fine to medium-grained sand fining down.	
300				

Layne GeoSciences
Boring Log

PROJECT : LWDS Antelope Valley

PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DATE: 7/31/2003 thru 8/1/2003
LAT: N 34* 50. 404'
LONG: W 118* 24. 273'
GROUND SURFACE ELEVATION (ft msl) : NA

DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to coarse-grained sand.	
305			Silty fine to coarse-grained sand with interbedded clay.	
310				
315			Clay with interbedded sands.	
320				
325			Silty fine to coarse-grained sand with trace clay content.	
330			Silty fine to medium-grained sand with interbedded clay.	SWL tagged at 331ft. bgs through inner tube 720am on 8/1/2003.
335				
340			Silty fine to coarse-grained sand with interbedded clay.	
345				
350				

Layne GeoSciences
Boring Log

BORING NUMBER : TH-4

PROJECT : LWDS Antelope Valley

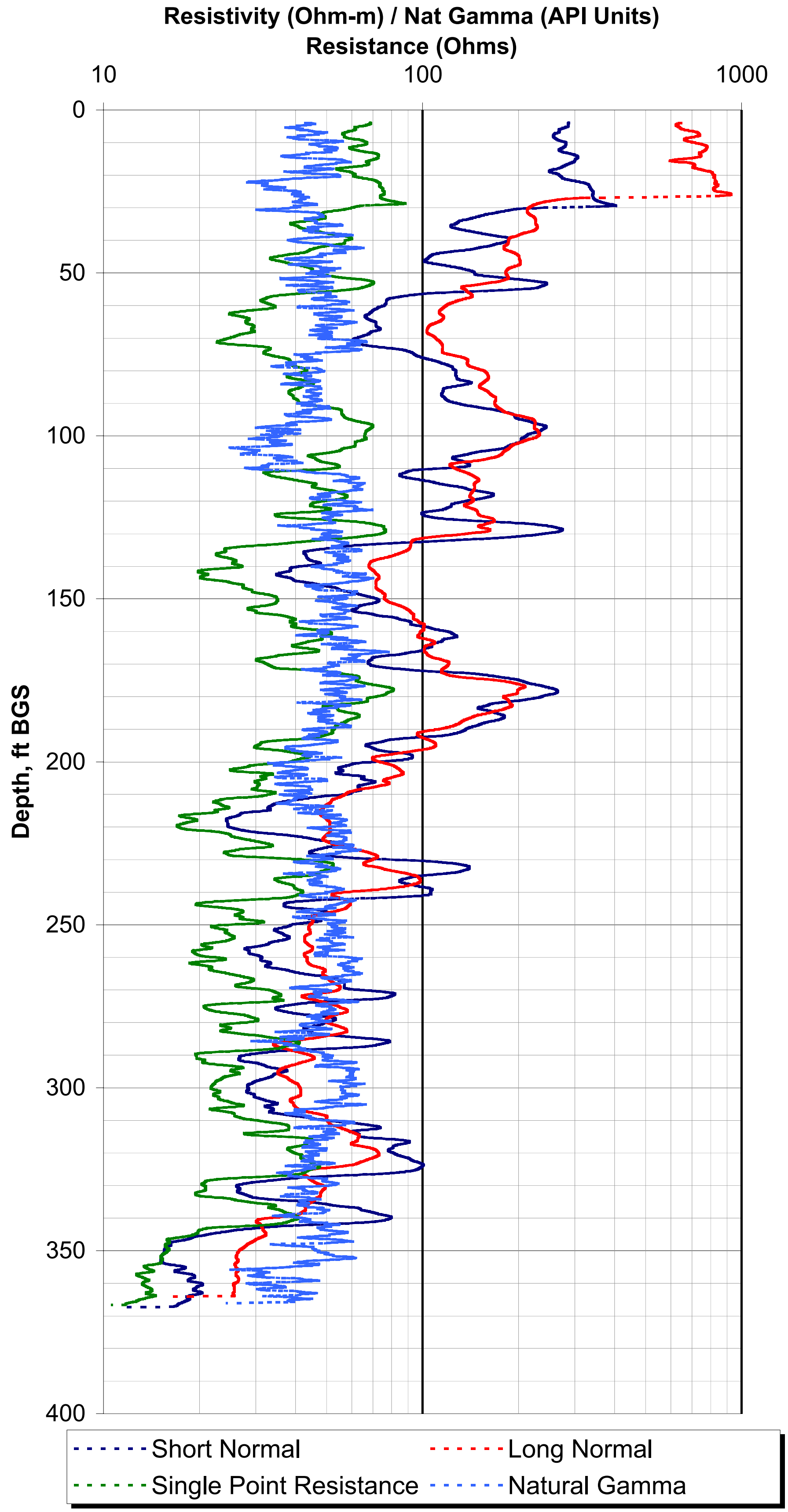
PROJECT NUMBER: 27-7897
DRILLING METHOD : Reverse Dual Wall Air
DRILLING CONTRACTOR : Layne Christensen Co.
LOGGER : LK
LOCATION : 155th St. and Willow Ave. Behind abandoned gas station.

DATE: 7/31/2003 thru 8/1/2003
LAT: N 34* 50. 404'
LONG: W 118* 24. 273'
GROUND SURFACE ELEVATION (ft msl) : NA

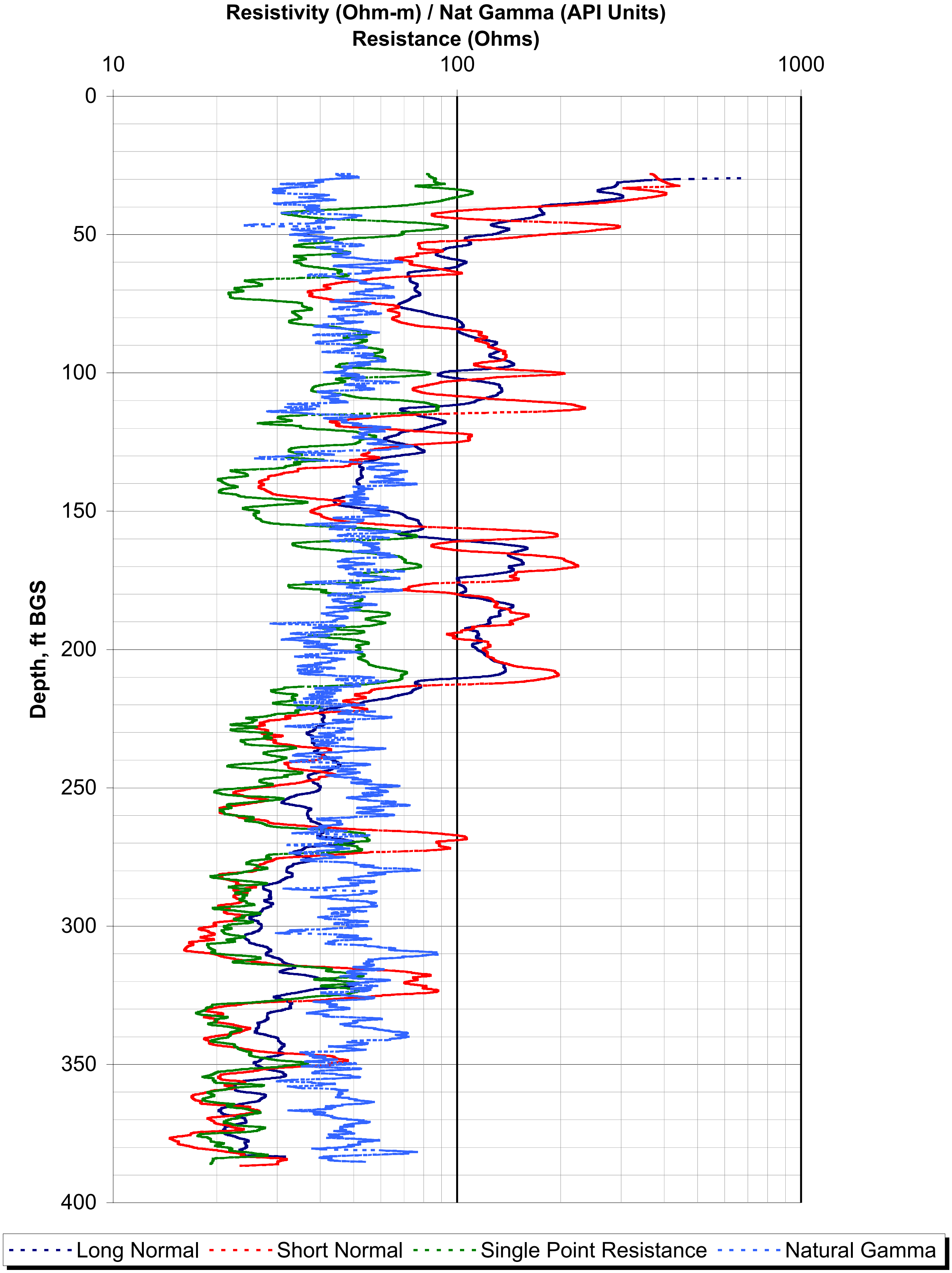
DEPTH (FT)	TIME	USCS	SAMPLE DESCRIPTION	COMMENTS
			Silty fine to coarse-grained sand with trace gravel content.	
355			Silty sandy clay.	Water Sample taken at 358ft. bgs Temp.: 22.7 Celcius, pH 8.1, Cond.: 270 ms.
360			Clay with interbedded fine to medium-grained sand.	
365			Fine to coarse-grained sand with interbedded clay lenses.	
370			Silty clayey fine grained-sand.	
375			Clay with interbedded sands.	08/01/2003
380			Gravelly fine to coarse-grained sand.	
385			Fine to coarse-grained sand with interbedded clay lenses.	
390			Clay with interbedded silty fine to medium-grained sand.	
395				TD at 398ft. bgs. E-log and abandon as per instructions.
400				

BOREHOLE GEOPHYSICAL LOGS

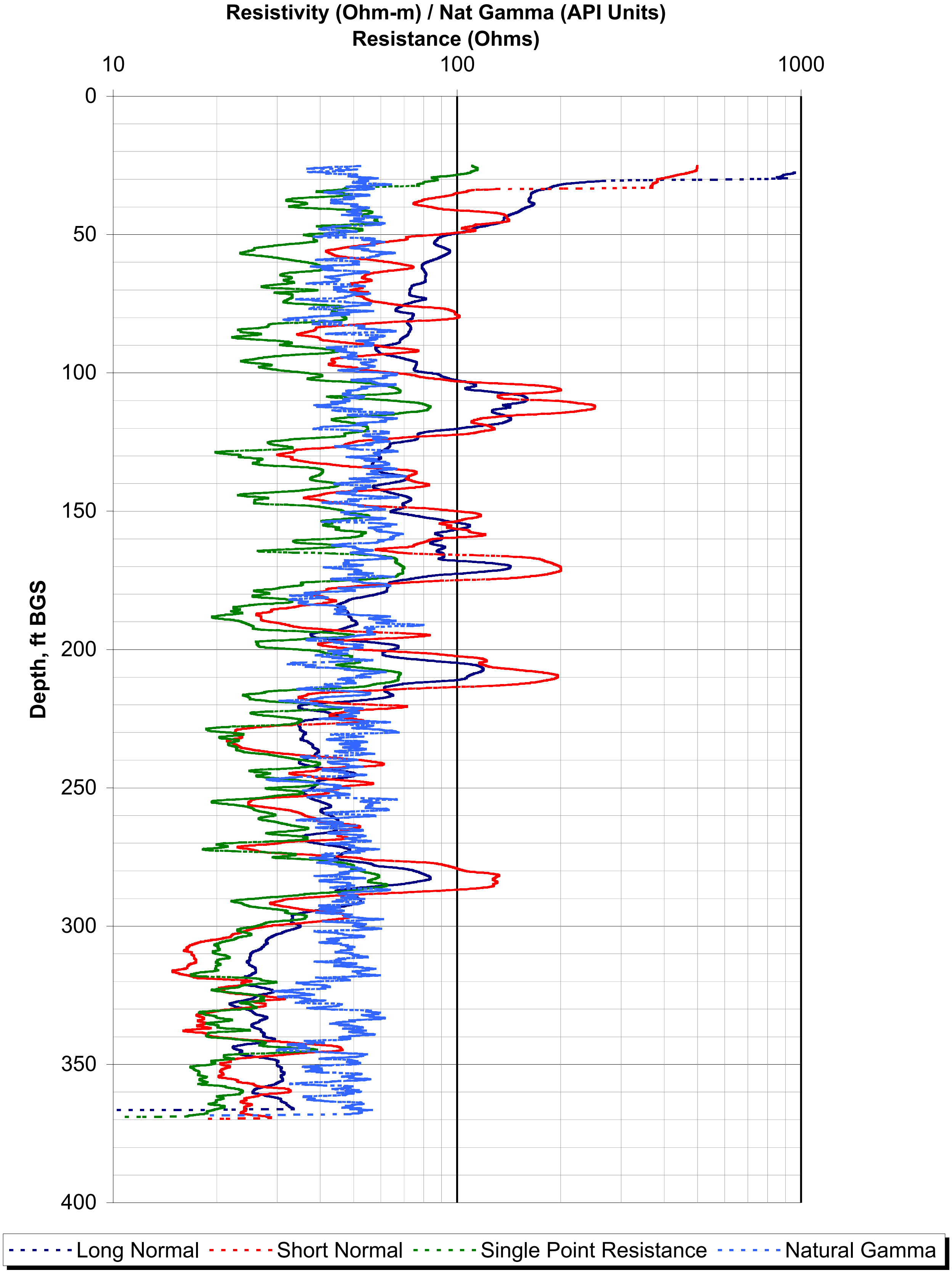
Exploratory Test Hole 2
Borehole Geophysical Logs



Exploratory Test Hole 3
Borehole Geophysical Log
Van Dam Property



Exploratory Test Hole 4
Borehole Geophysical Log
Van Dam Property



SIEVE ANALYSES

MECHANICAL SIEVE ANALYSIS

Layne Christensen Company
11001 Etiwanda Avenue
Fontana, CA 92337
909-390-2833
909-390-6097 FAX

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 400-405 ft

Tested By: LK

Test Date: 11-Aug-03

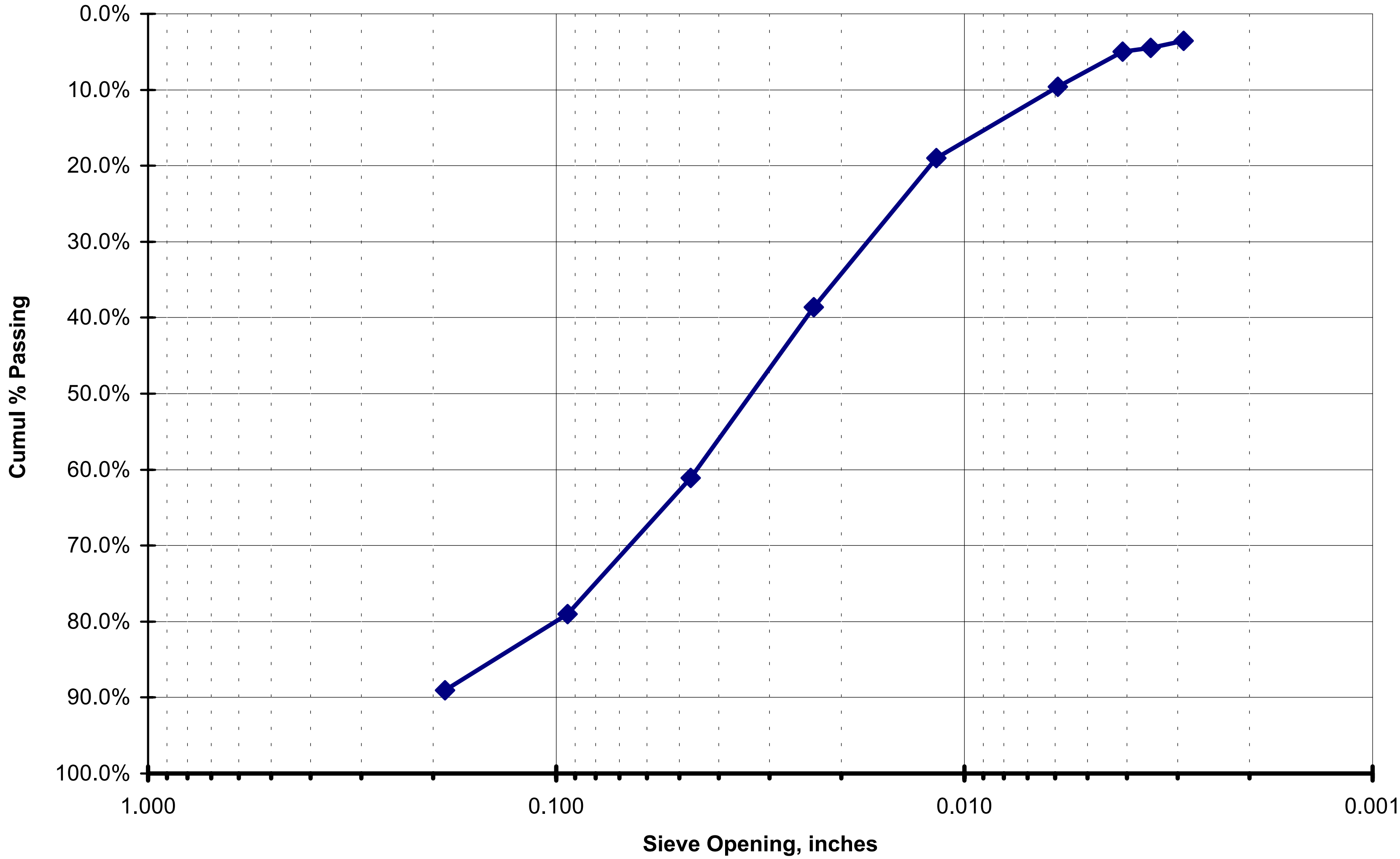
Wt. of dry sample + container	738 grams
Wt. of container	0 grams
Wt. of dry sample	738 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	81	89.0%	11.0%	81
8	2.3600	0.0937	155	79.0%	21.0%	74
16	1.1800	0.0469	287	61.1%	38.9%	132
30	0.6000	0.0234	453	38.6%	61.4%	166
50	0.3000	0.0117	598	19.0%	81.0%	145
100	0.1500	0.0059	667	9.6%	90.4%	69
140	0.1060	0.0041	701	5.0%	95.0%	34
170	0.0900	0.0035	705	4.5%	95.5%	4
200	0.0750	0.0029	712	3.5%	96.5%	7
Pan			738	0.0%	100.0%	26

Total Wt of Sample, grams	738		738
Total Wt of Sample (initial), grams	738		
% Error	0.0%		

Gravel %	21.00%	Gr+Sa/Si+Cl ratio	27.4
Sand %	75.47%		
Silts+Clays	3.52%		

Sieve Analysis



TH2 400-405.xls

Layne Christensen Company
11001 Etiwanda Avenue
Fontana, CA 92337
909-390-2833
909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 365-370 ft

Tested By: LK

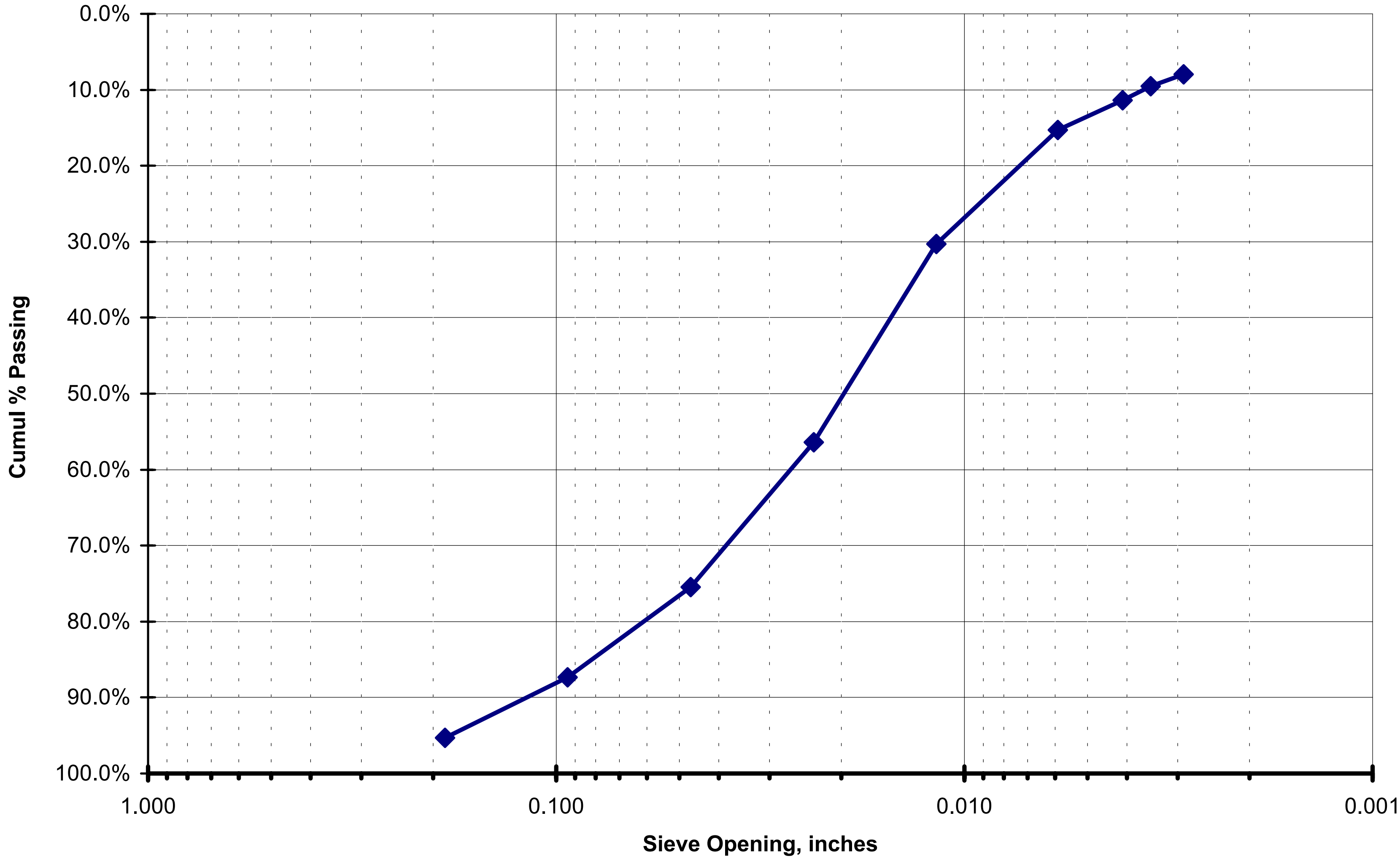
Test Date: 11-Aug-03

Wt. of dry sample + container	640 grams
Wt. of container	0 grams
Wt. of dry sample	640 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	30	95.3%	4.7%	30
8	2.3600	0.0937	81	87.3%	12.7%	51
16	1.1800	0.0469	157	75.5%	24.5%	76
30	0.6000	0.0234	279	56.4%	43.6%	122
50	0.3000	0.0117	446	30.3%	69.7%	167
100	0.1500	0.0059	542	15.3%	84.7%	96
140	0.1060	0.0041	567	11.4%	88.6%	25
170	0.0900	0.0035	579	9.5%	90.5%	12
200	0.0750	0.0029	589	8.0%	92.0%	10
Pan			640	0.0%	100.0%	51
Total Wt of Sample, grams			640			640
Total Wt of Sample (initial), grams			640			
% Error			0.0%			

Gravel %	12.66%	Gr+Sa/Si+Cl ratio	11.5
Sand %	79.38%		
Silts+Clays	7.97%		

Sieve Analysis



TH2 365-370.xls

Layne Christensen Company
11001 Etiwanda Avenue
Fontana, CA 92337
909-390-2833
909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 260-265 ft

Tested By: LK

Test Date: 11-Aug-03

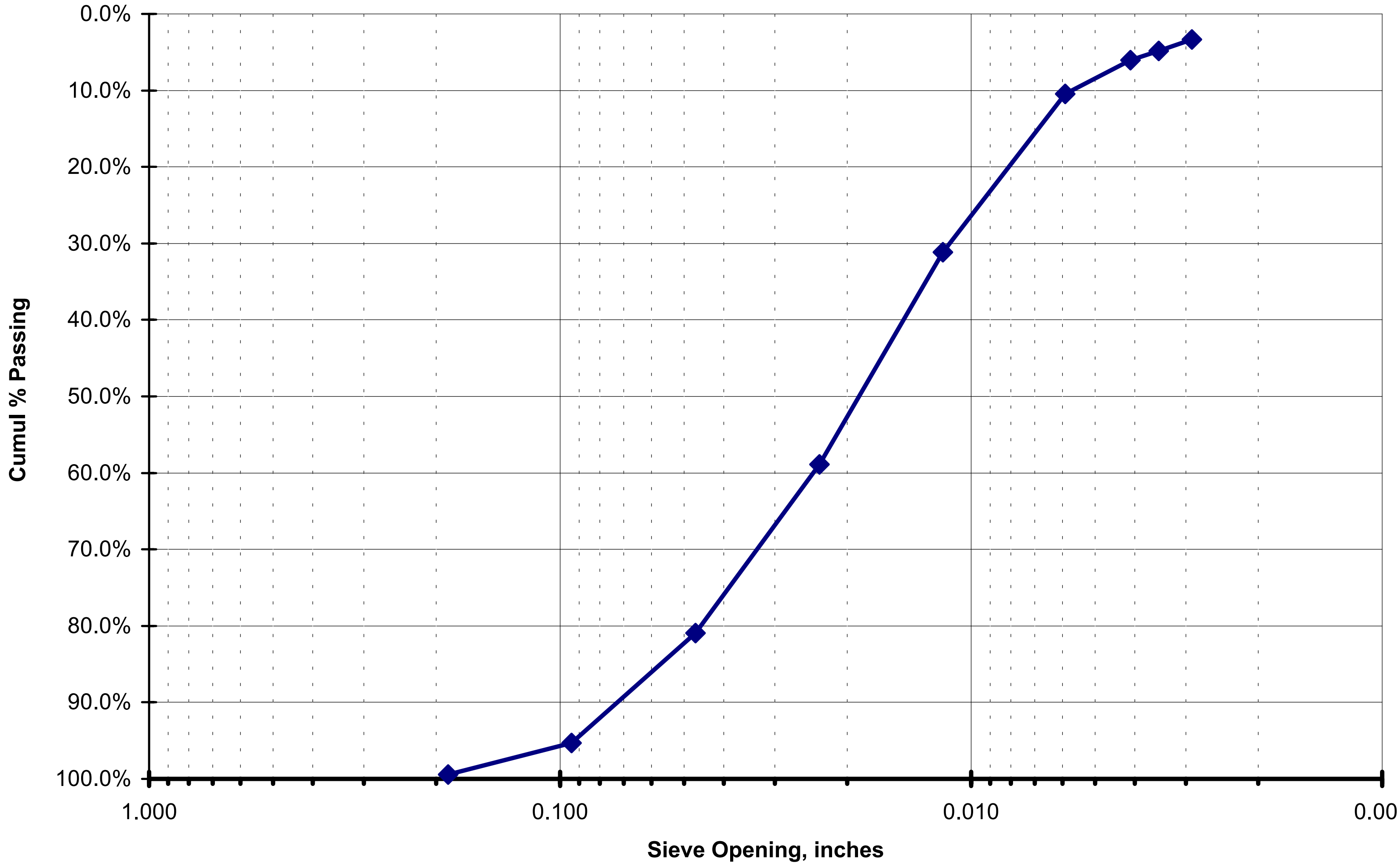
Wt. of dry sample + container	681 grams
Wt. of container	0 grams
Wt. of dry sample	681 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.4%	0.6%	4
8	2.3600	0.0937	32	95.3%	4.7%	28
16	1.1800	0.0469	130	80.9%	19.1%	98
30	0.6000	0.0234	280	58.9%	41.1%	150
50	0.3000	0.0117	469	31.1%	68.9%	189
100	0.1500	0.0059	610	10.4%	89.6%	141
140	0.1060	0.0041	640	6.0%	94.0%	30
170	0.0900	0.0035	648	4.8%	95.2%	8
200	0.0750	0.0029	658	3.4%	96.6%	10
Pan			681	0.0%	100.0%	23

Total Wt of Sample, grams	681	681
Total Wt of Sample (initial), grams	681	
% Error	0.0%	

Gravel %	4.70%	Gr+Sa/Si+Cl ratio	28.6
Sand %	91.92%		
Silts+Clays	3.38%		

Sieve Analysis



TH2 260-265.xls

Layne Christensen Company
11001 Etiwanda Avenue
Fontana, CA 92337
909-390-2833
909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 175-180 ft

Tested By: LK

Test Date: 12-Aug-03

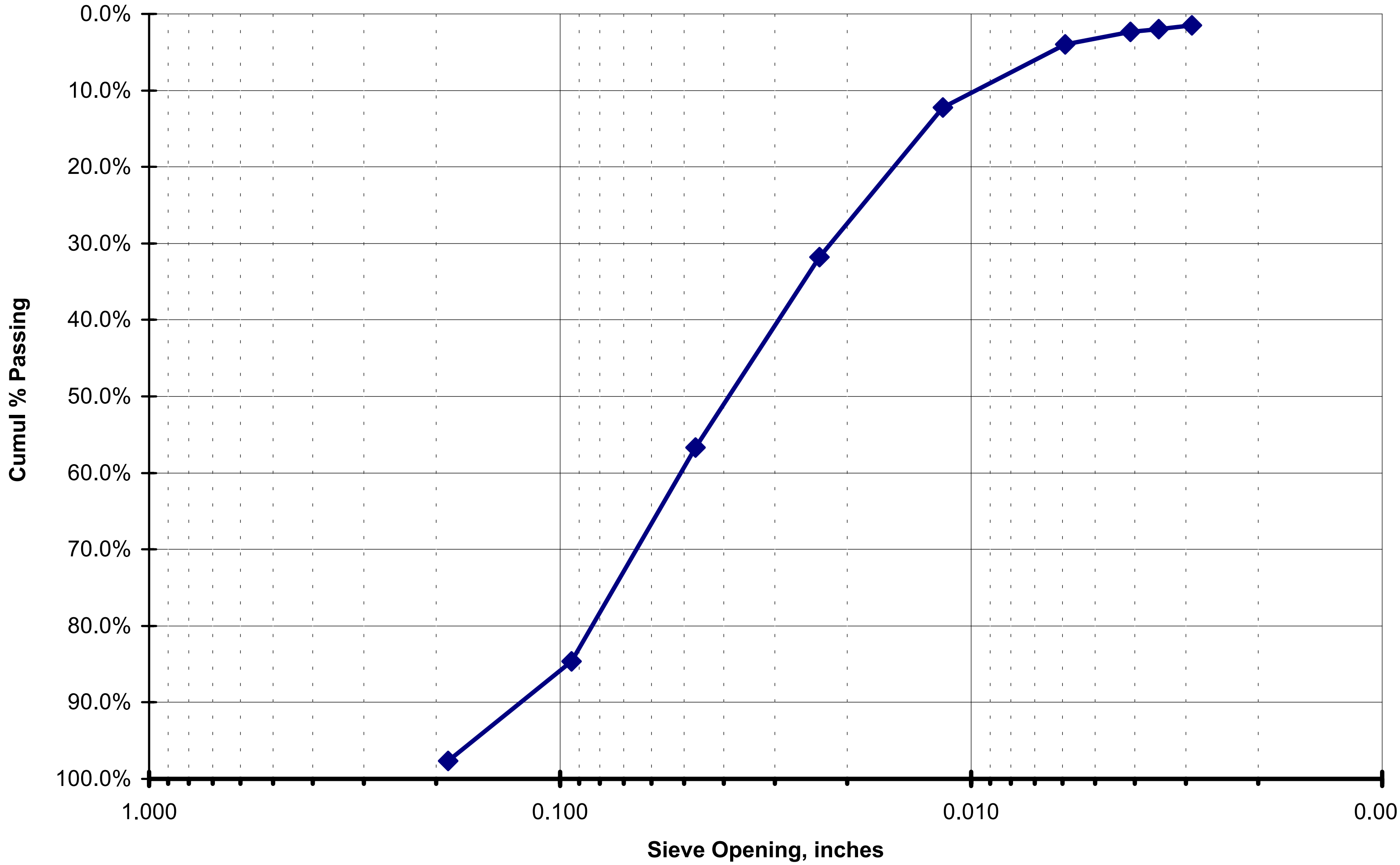
Wt. of dry sample + container	598 grams
Wt. of container	0 grams
Wt. of dry sample	598 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	14	97.7%	2.3%	14
8	2.3600	0.0937	92	84.6%	15.4%	78
16	1.1800	0.0469	259	56.7%	43.3%	167
30	0.6000	0.0234	408	31.8%	68.2%	149
50	0.3000	0.0117	525	12.2%	87.8%	117
100	0.1500	0.0059	574	4.0%	96.0%	49
140	0.1060	0.0041	584	2.3%	97.7%	10
170	0.0900	0.0035	586	2.0%	98.0%	2
200	0.0750	0.0029	589	1.5%	98.5%	3
Pan			598	0.0%	100.0%	9

Total Wt of Sample, grams	598	598
Total Wt of Sample (initial), grams	598	
% Error	0.0%	

Gravel %	15.38%	Gr+Sa/Si+Cl ratio	65.4
Sand %	83.11%		
Silts+Clays	1.51%		

Sieve Analysis



TH2 175-180.xls

Layne Christensen Company
11001 Etiwanda Avenue
Fontana, CA 92337
909-390-2833
909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 140-145 ft

Tested By: LK

Test Date: 11-Aug-03

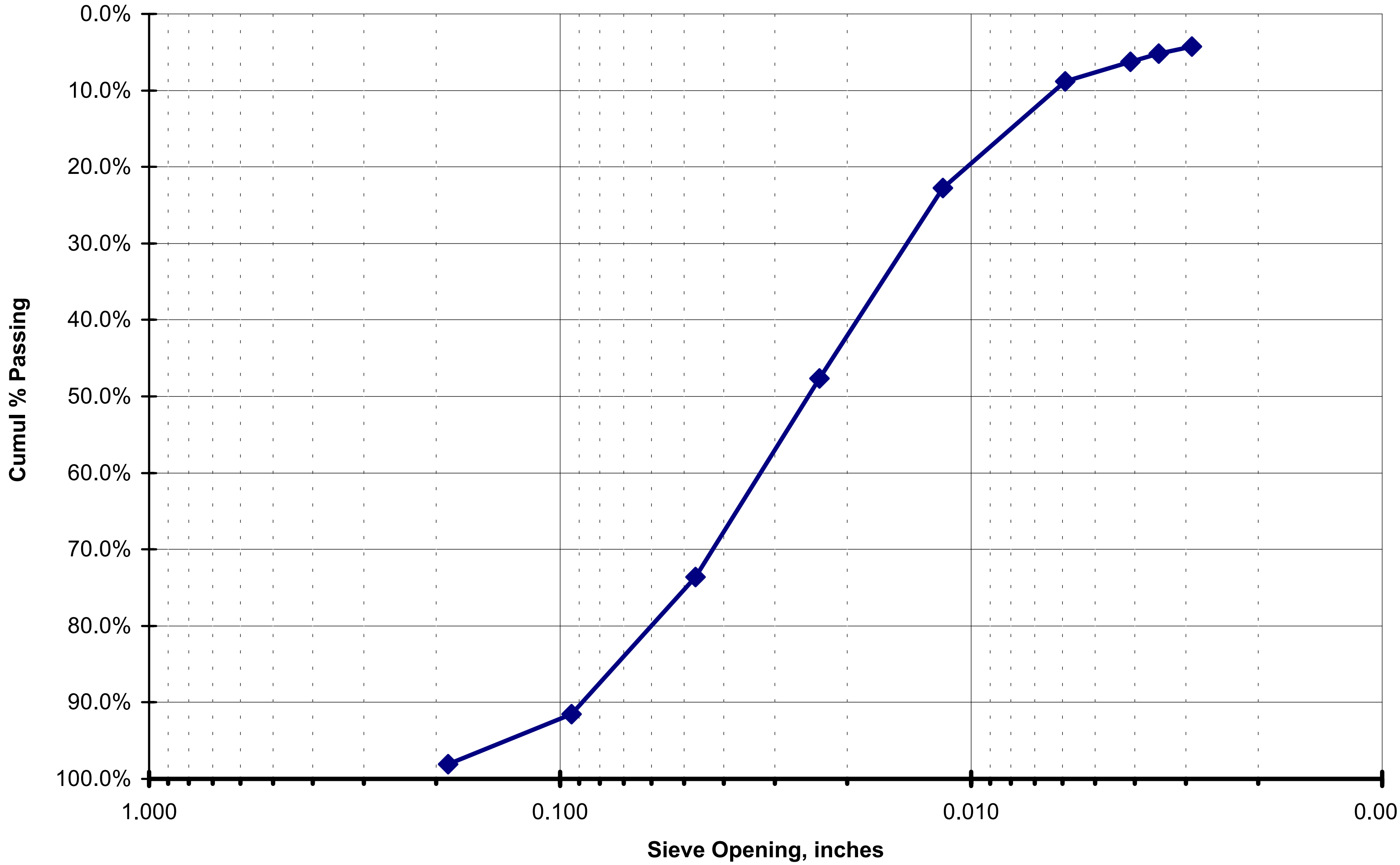
Wt. of dry sample + container	770 grams
Wt. of container	0 grams
Wt. of dry sample	770 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	15	98.1%	1.9%	15
8	2.3600	0.0937	65	91.6%	8.4%	50
16	1.1800	0.0469	203	73.6%	26.4%	138
30	0.6000	0.0234	403	47.7%	52.3%	200
50	0.3000	0.0117	595	22.7%	77.3%	192
100	0.1500	0.0059	702	8.8%	91.2%	107
140	0.1060	0.0041	722	6.2%	93.8%	20
170	0.0900	0.0035	730	5.2%	94.8%	8
200	0.0750	0.0029	737	4.3%	95.7%	7
Pan			769	0.1%	99.9%	32

Total Wt of Sample, grams	769	769
Total Wt of Sample (initial), grams	770	
% Error	0.1%	

Gravel %	8.44%	Gr+Sa/Si+Cl ratio	22.3
Sand %	87.27%		
Silts+Clays	4.29%		

Sieve Analysis



TH2 140-145.xls

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Fontana, CA 92337
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909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 95-100 ft

Tested By: LK

Test Date: 12-Aug-03

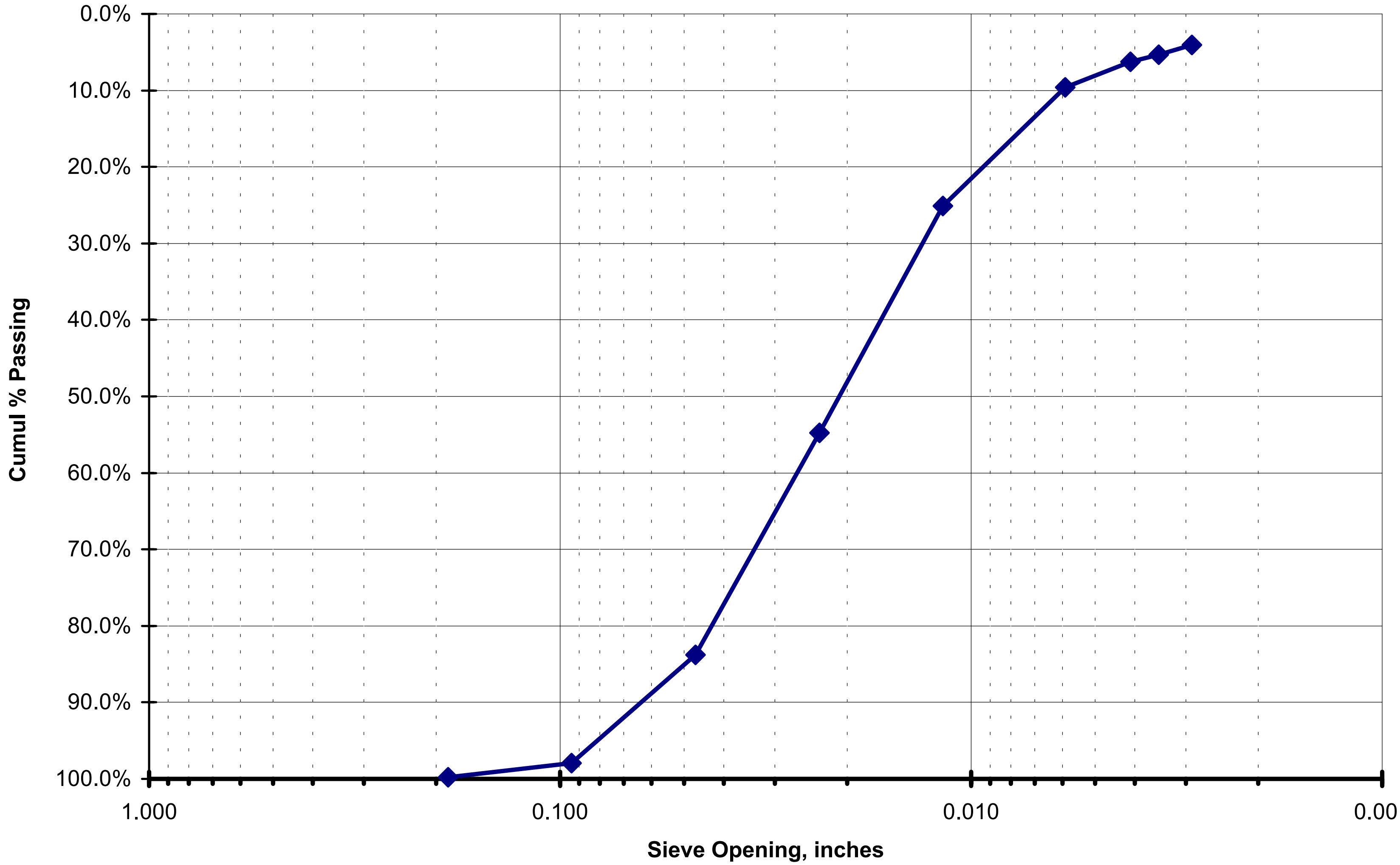
Wt. of dry sample + container	542	grams
Wt. of container	0	grams
Wt. of dry sample	542	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	1	99.8%	0.2%	1
8	2.3600	0.0937	11	98.0%	2.0%	10
16	1.1800	0.0469	88	83.8%	16.2%	77
30	0.6000	0.0234	245	54.8%	45.2%	157
50	0.3000	0.0117	406	25.1%	74.9%	161
100	0.1500	0.0059	490	9.6%	90.4%	84
140	0.1060	0.0041	508	6.3%	93.7%	18
170	0.0900	0.0035	513	5.4%	94.6%	5
200	0.0750	0.0029	520	4.1%	95.9%	7
Pan			542	0.0%	100.0%	22

Total Wt of Sample, grams	542		542
Total Wt of Sample (initial), grams	542		
% Error	0.0%		

Gravel %	2.03%	Gr+Sa/Si+Cl ratio	23.6
Sand %	93.91%		
Silts+Clays	4.06%		

Sieve Analysis



TH2 95-100.xls

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909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 75-80 ft

Tested By: LK

Test Date: 12-Aug-03

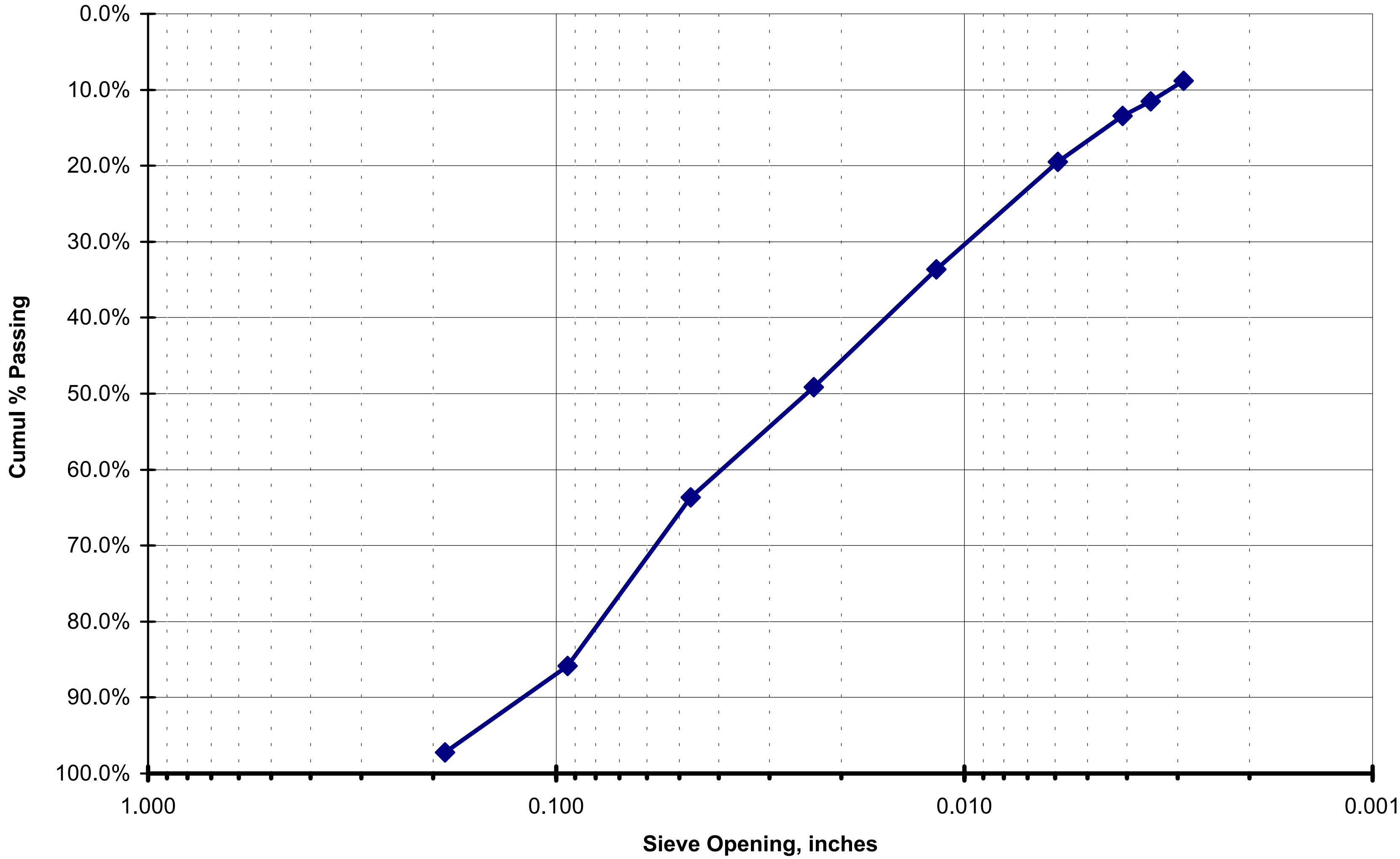
Wt. of dry sample + container	580 grams
Wt. of container	0 grams
Wt. of dry sample	580 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	16	97.2%	2.8%	16
8	2.3600	0.0937	82	85.9%	14.1%	66
16	1.1800	0.0469	211	63.6%	36.4%	129
30	0.6000	0.0234	295	49.1%	50.9%	84
50	0.3000	0.0117	385	33.6%	66.4%	90
100	0.1500	0.0059	467	19.5%	80.5%	82
140	0.1060	0.0041	502	13.4%	86.6%	35
170	0.0900	0.0035	513	11.6%	88.4%	11
200	0.0750	0.0029	529	8.8%	91.2%	16
Pan			579	0.2%	99.8%	50

Total Wt of Sample, grams	579	579
Total Wt of Sample (initial), grams	580	
% Error	0.2%	

Gravel %	14.1%	Gr+Sa/Si+Cl ratio	10.4
Sand %	77.1%		
Silts+Clays	8.8%		

Sieve Analysis



TH2 75-80 ft.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-2

Depth: 470-475 ft

Tested By: LK

Test Date: 11-Aug-03

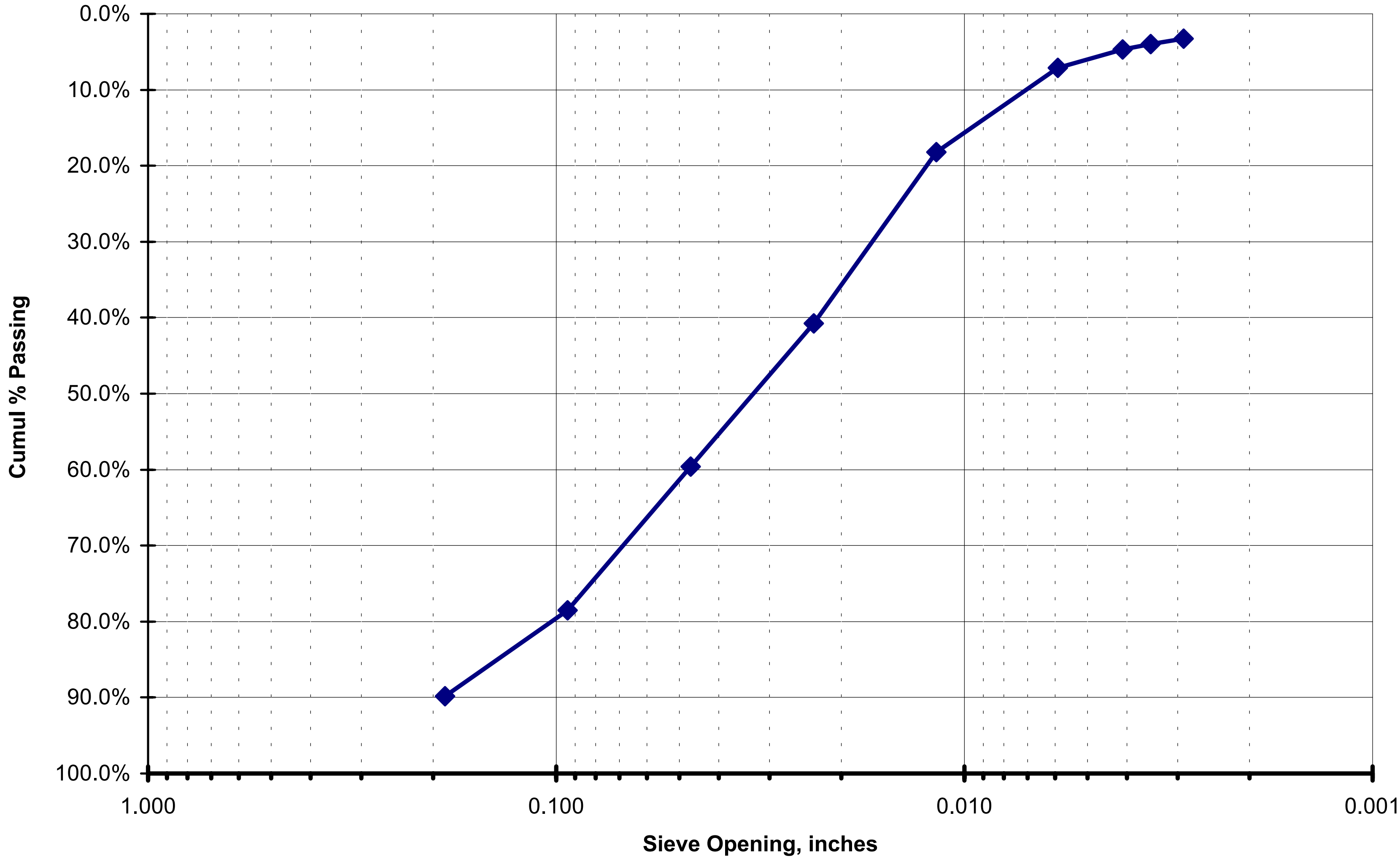
Wt. of dry sample + container	550 grams
Wt. of container	0 grams
Wt. of dry sample	550 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	56	89.8%	10.2%	56
8	2.3600	0.0937	118	78.5%	21.5%	62
16	1.1800	0.0469	222	59.6%	40.4%	104
30	0.6000	0.0234	326	40.7%	59.3%	104
50	0.3000	0.0117	450	18.2%	81.8%	124
100	0.1500	0.0059	511	7.1%	92.9%	61
140	0.1060	0.0041	524	4.7%	95.3%	13
170	0.0900	0.0035	528	4.0%	96.0%	4
200	0.0750	0.0029	532	3.3%	96.7%	4
Pan			550	0.0%	100.0%	18

Total Wt of Sample, grams	550	550
Total Wt of Sample (initial), grams	550	
% Error	0.0%	

Gravel %	21.45%	Gr+Sa/Si+Cl ratio	29.6
Sand %	75.27%		
Silts+Clays	3.27%		

Sieve Analysis



TH2 470-475.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 370-375 ft

Tested By: LK

Test Date: 10-Aug-03

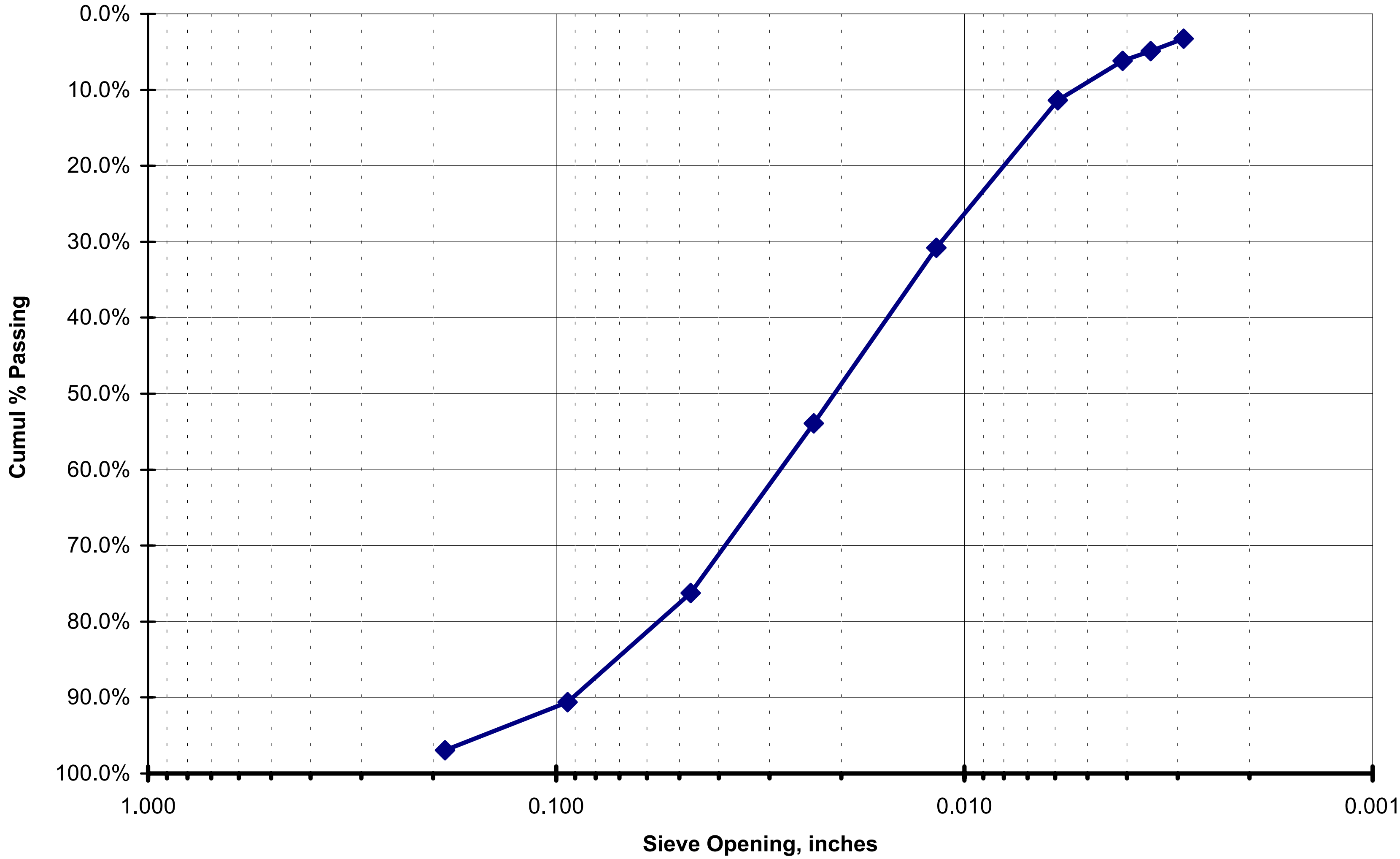
Wt. of dry sample + container	757	grams
Wt. of container	0	grams
Wt. of dry sample	757	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	23	97.0%	3.0%	23
8	2.3600	0.0937	71	90.6%	9.4%	48
16	1.1800	0.0469	180	76.2%	23.8%	109
30	0.6000	0.0234	349	53.9%	46.1%	169
50	0.3000	0.0117	524	30.8%	69.2%	175
100	0.1500	0.0059	671	11.4%	88.6%	147
140	0.1060	0.0041	710	6.2%	93.8%	39
170	0.0900	0.0035	720	4.9%	95.1%	10
200	0.0750	0.0029	732	3.3%	96.7%	12
Pan			758	-0.1%	100.1%	26

Total Wt of Sample, grams	758	758
Total Wt of Sample (initial), grams	757	
% Error	-0.1%	

Gravel %	9.38%	Gr+Sa/Si+Cl ratio	29.3
Sand %	87.32%		
Silts+Clays	3.30%		

Sieve Analysis



TH3 370-375.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 315-320 ft

Tested By: LK

Test Date: 11-Aug-03

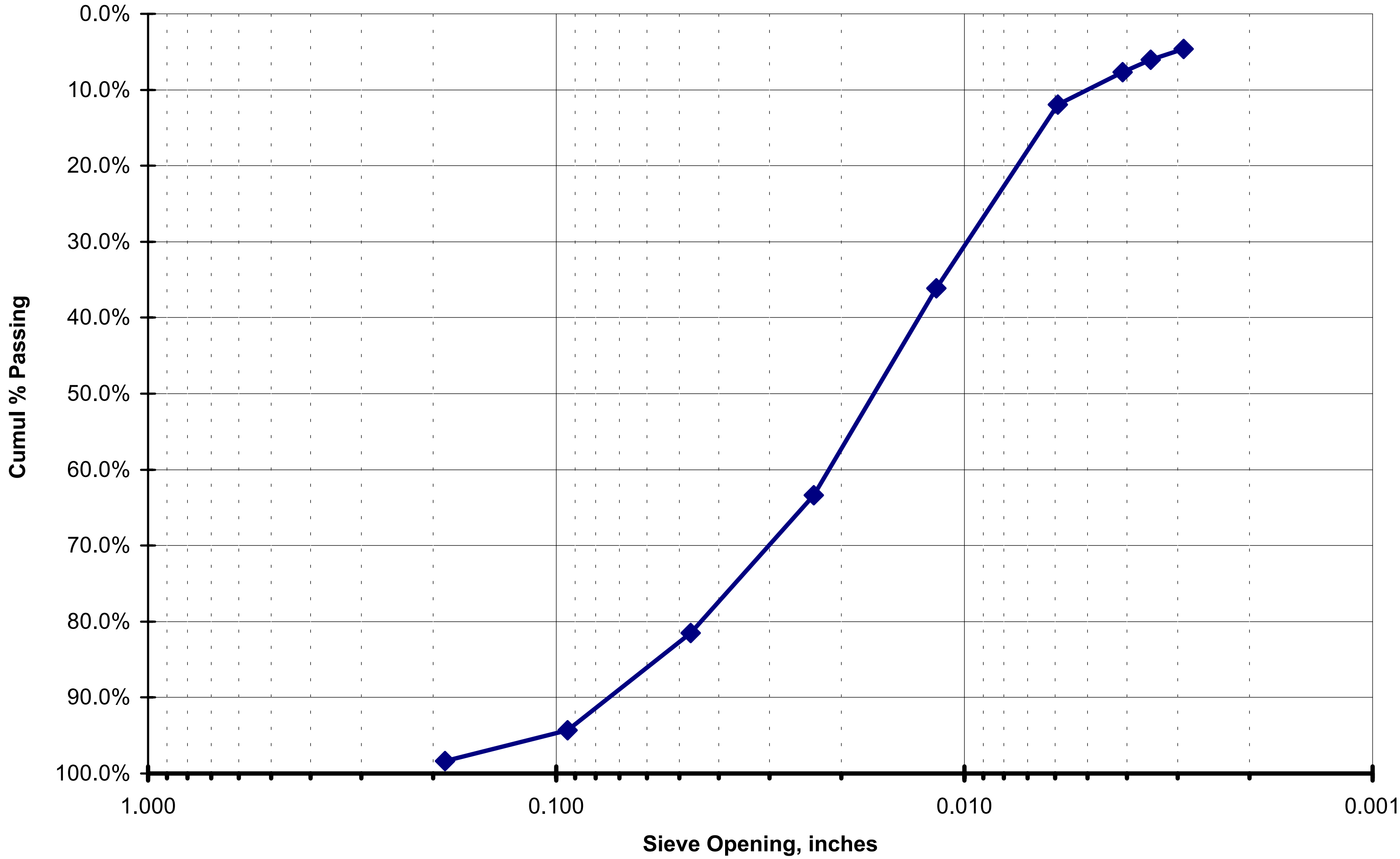
Wt. of dry sample + container	562	grams
Wt. of container	0	grams
Wt. of dry sample	562	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	9	98.4%	1.6%	9
8	2.3600	0.0937	32	94.3%	5.7%	23
16	1.1800	0.0469	104	81.5%	18.5%	72
30	0.6000	0.0234	206	63.3%	36.7%	102
50	0.3000	0.0117	359	36.1%	63.9%	153
100	0.1500	0.0059	495	11.9%	88.1%	136
140	0.1060	0.0041	519	7.7%	92.3%	24
170	0.0900	0.0035	528	6.0%	94.0%	9
200	0.0750	0.0029	536	4.6%	95.4%	8
Pan			562	0.0%	100.0%	26

Total Wt of Sample, grams	562	562
Total Wt of Sample (initial), grams	562	
% Error	0.0%	

Gravel %	5.69%	Gr+Sa/Si+Cl ratio	20.6
Sand %	89.68%		
Silts+Clays	4.63%		

Sieve Analysis



TH3 315-320.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 237-245 ft

Tested By: LK

Test Date: 11-Aug-03

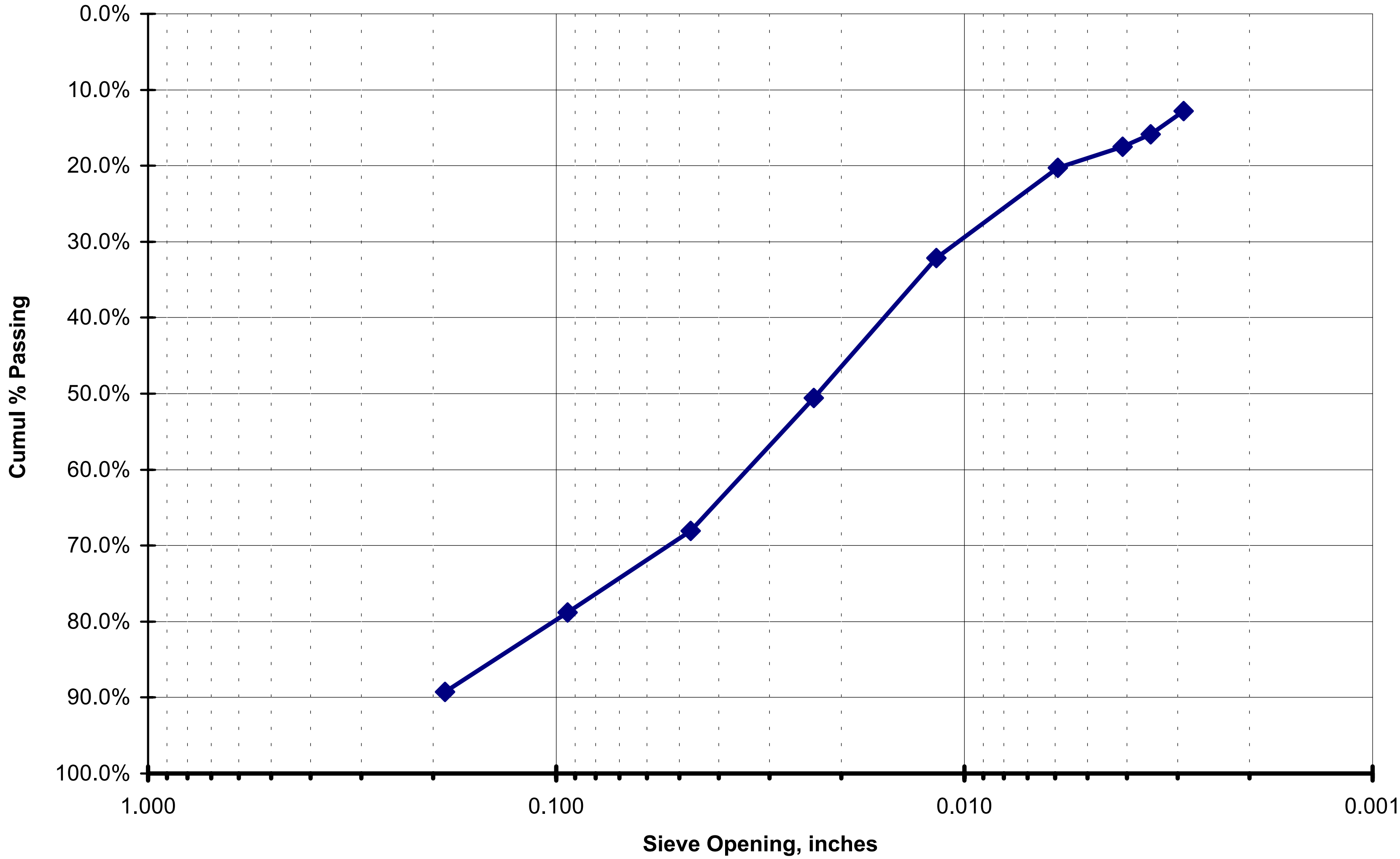
Wt. of dry sample + container	429	grams
Wt. of container	0	grams
Wt. of dry sample	429	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	46	89.3%	10.7%	46
8	2.3600	0.0937	91	78.8%	21.2%	45
16	1.1800	0.0469	137	68.1%	31.9%	46
30	0.6000	0.0234	212	50.6%	49.4%	75
50	0.3000	0.0117	291	32.2%	67.8%	79
100	0.1500	0.0059	342	20.3%	79.7%	51
140	0.1060	0.0041	354	17.5%	82.5%	12
170	0.0900	0.0035	361	15.9%	84.1%	7
200	0.0750	0.0029	374	12.8%	87.2%	13
Pan			428	0.2%	99.8%	54

Total Wt of Sample, grams	428	428
Total Wt of Sample (initial), grams	429	
% Error	0.2%	

Gravel %	21.21%	Gr+Sa/Si+Cl ratio	6.8
Sand %	65.97%		
Silts+Clays	12.82%		

Sieve Analysis



TH3 237-245.xls

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Fontana, CA 92337
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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 205-210 ft

Tested By: LK

Test Date: 10-Aug-03

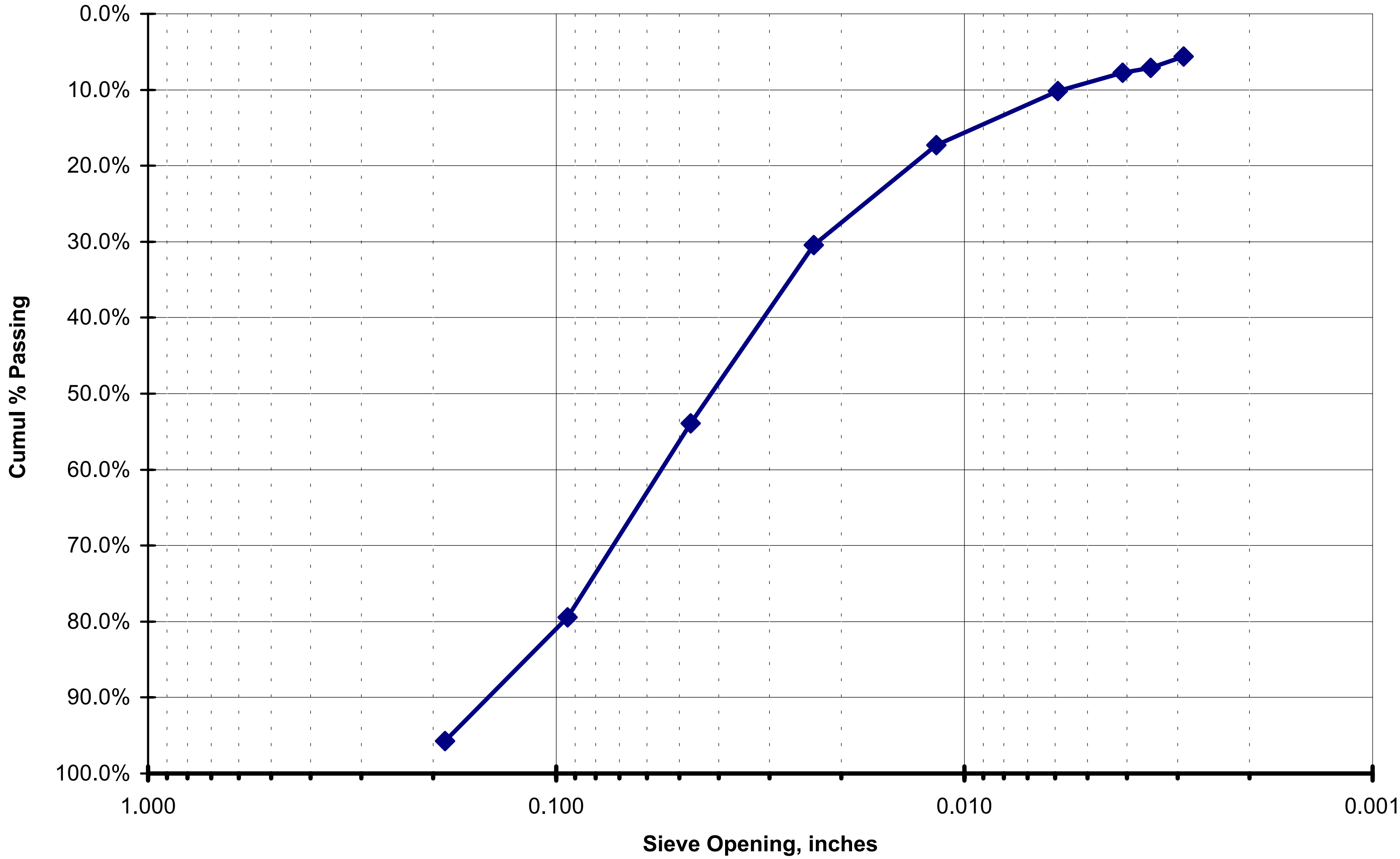
Wt. of dry sample + container	799	grams
Wt. of container	0	grams
Wt. of dry sample	799	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	34	95.7%	4.3%	34
8	2.3600	0.0937	164	79.5%	20.5%	130
16	1.1800	0.0469	368	53.9%	46.1%	204
30	0.6000	0.0234	556	30.4%	69.6%	188
50	0.3000	0.0117	661	17.3%	82.7%	105
100	0.1500	0.0059	718	10.1%	89.9%	57
140	0.1060	0.0041	737	7.8%	92.2%	19
170	0.0900	0.0035	742	7.1%	92.9%	5
200	0.0750	0.0029	754	5.6%	94.4%	12
Pan			799	0.0%	100.0%	45

Total Wt of Sample, grams	799	799
Total Wt of Sample (initial), grams	799	
% Error	0.0%	

Gravel %	20.53%	Gr+Sa/Si+Cl ratio	16.8
Sand %	73.84%		
Silts+Clays	5.63%		

Sieve Analysis



TH3 205-210.xls

MECHANICAL SIEVE ANALYSIS

Layne Christensen Company
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Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 165-170 ft

Tested By: LK

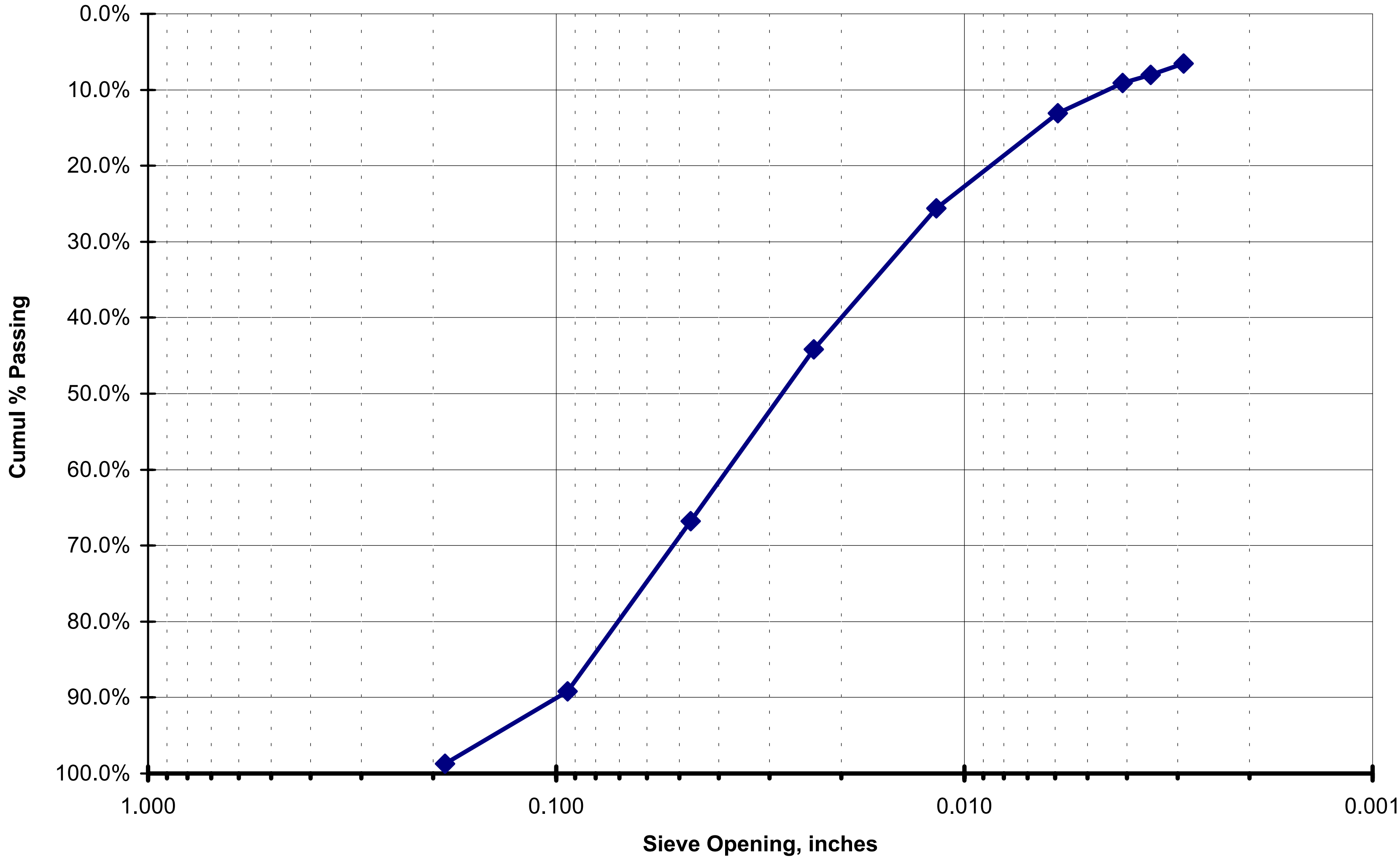
Test Date: 11-Aug-03

Wt. of dry sample + container	473	grams
Wt. of container	0	grams
Wt. of dry sample	473	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	6	98.7%	1.3%	6
8	2.3600	0.0937	51	89.2%	10.8%	45
16	1.1800	0.0469	157	66.8%	33.2%	106
30	0.6000	0.0234	264	44.2%	55.8%	107
50	0.3000	0.0117	352	25.6%	74.4%	88
100	0.1500	0.0059	411	13.1%	86.9%	59
140	0.1060	0.0041	430	9.1%	90.9%	19
170	0.0900	0.0035	435	8.0%	92.0%	5
200	0.0750	0.0029	442	6.6%	93.4%	7
Pan			473	0.0%	100.0%	31
Total Wt of Sample, grams			473			473
Total Wt of Sample (initial), grams			473			
% Error			0.0%			

Gravel %	10.78%	Gr+Sa/Si+Cl ratio	14.3
Sand %	82.66%		
Silts+Clays	6.55%		

Sieve Analysis



TH3 165-170.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 140-145 ft

Tested By: LK

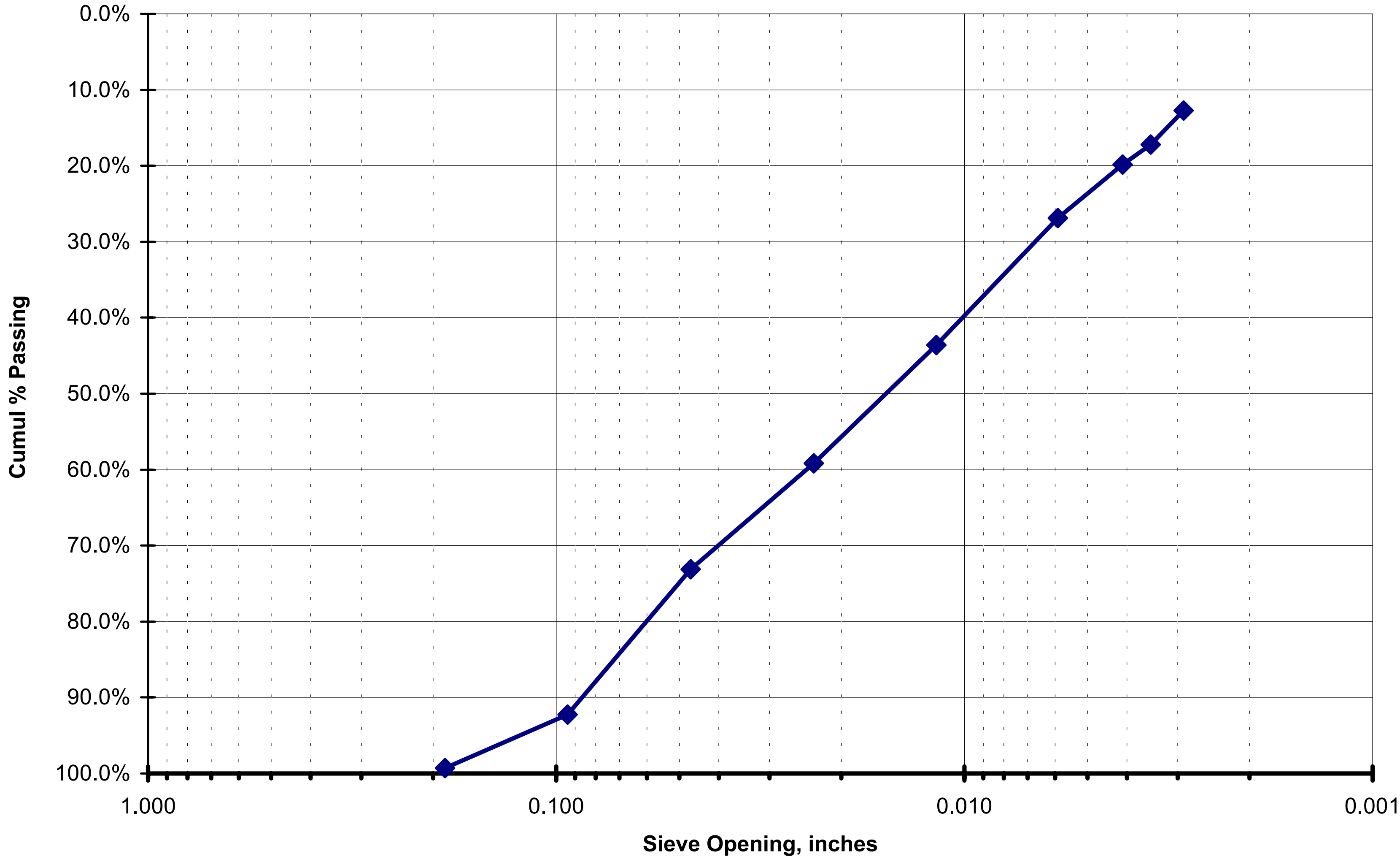
Test Date: 11-Aug-03

Wt. of dry sample + container	424 grams
Wt. of container	0 grams
Wt. of dry sample	424 grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	3	99.3%	0.7%	3
8	2.3600	0.0937	33	92.2%	7.8%	30
16	1.1800	0.0469	114	73.1%	26.9%	81
30	0.6000	0.0234	173	59.2%	40.8%	59
50	0.3000	0.0117	239	43.6%	56.4%	66
100	0.1500	0.0059	310	26.9%	73.1%	71
140	0.1060	0.0041	340	19.8%	80.2%	30
170	0.0900	0.0035	351	17.2%	82.8%	11
200	0.0750	0.0029	370	12.7%	87.3%	19
Pan			424	0.0%	100.0%	54
Total Wt of Sample, grams			424			424
Total Wt of Sample (initial), grams			424			
% Error			0.0%			

Gravel %	7.78%	Gr+Sa/Si+Cl ratio	6.9
Sand %	79.48%		
Silts+Clays	12.74%		

Sieve Analysis



TH3 140-145.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 45-50 ft

Tested By: LK

Test Date: 10-Aug-03

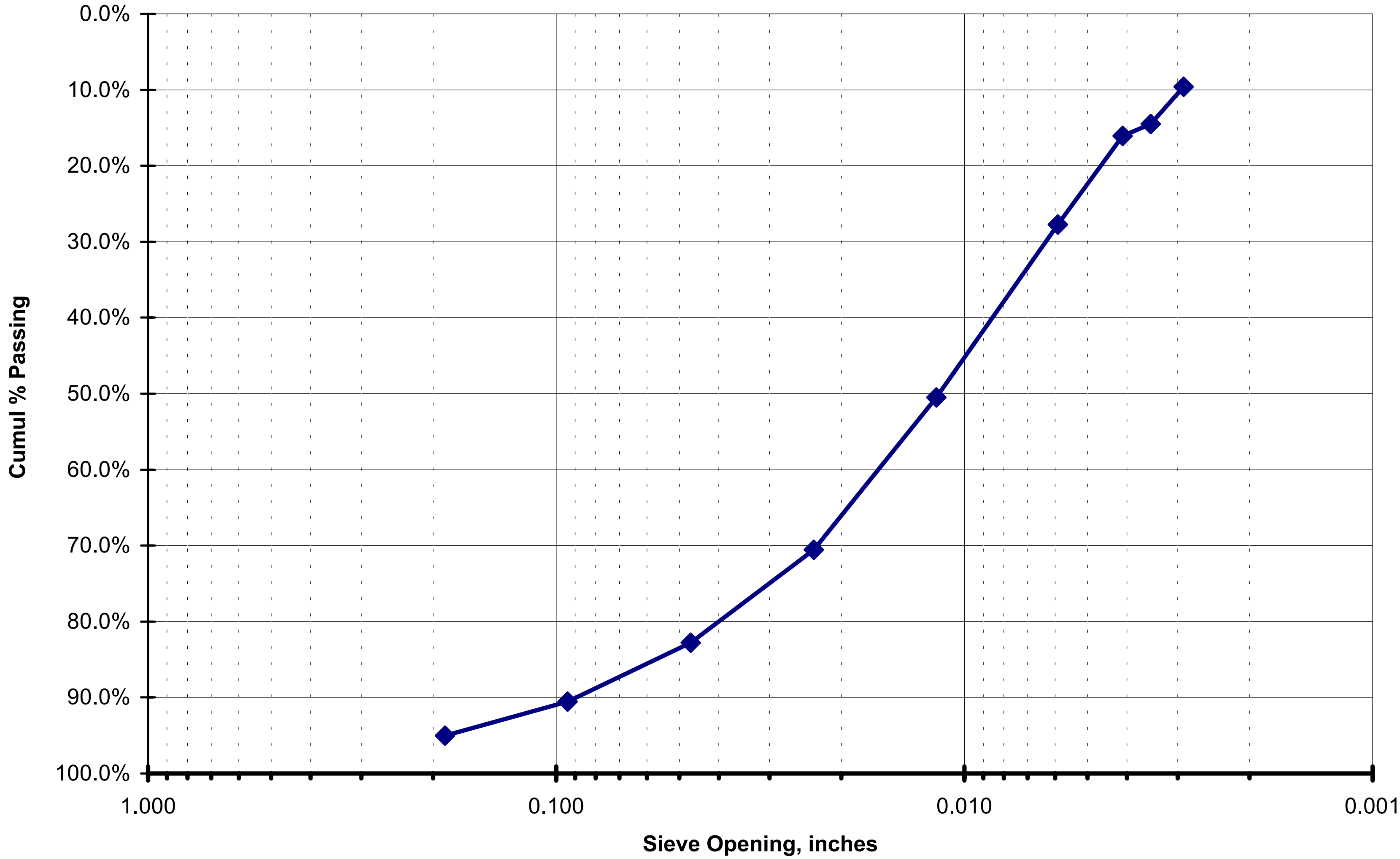
Wt. of dry sample + container	760	grams
Wt. of container	0	grams
Wt. of dry sample	760	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	38	95.0%	5.0%	38
8	2.3600	0.0937	72	90.5%	9.5%	34
16	1.1800	0.0469	131	82.8%	17.2%	59
30	0.6000	0.0234	224	70.5%	29.5%	93
50	0.3000	0.0117	376	50.5%	49.5%	152
100	0.1500	0.0059	549	27.8%	72.2%	173
140	0.1060	0.0041	638	16.1%	83.9%	89
170	0.0900	0.0035	650	14.5%	85.5%	12
200	0.0750	0.0029	687	9.6%	90.4%	37
Pan			760	0.0%	100.0%	73

Total Wt of Sample, grams	760		760
Total Wt of Sample (initial), grams	760		
% Error	0.0%		

Gravel %	9.47%	Gr+Sa/Si+Cl ratio	9.4
Sand %	80.92%		
Silts+Clays	9.61%		

Sieve Analysis



TH3 45-50.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-3

Depth: 425-430 ft

Tested By: LK

Test Date: 10-Aug-03

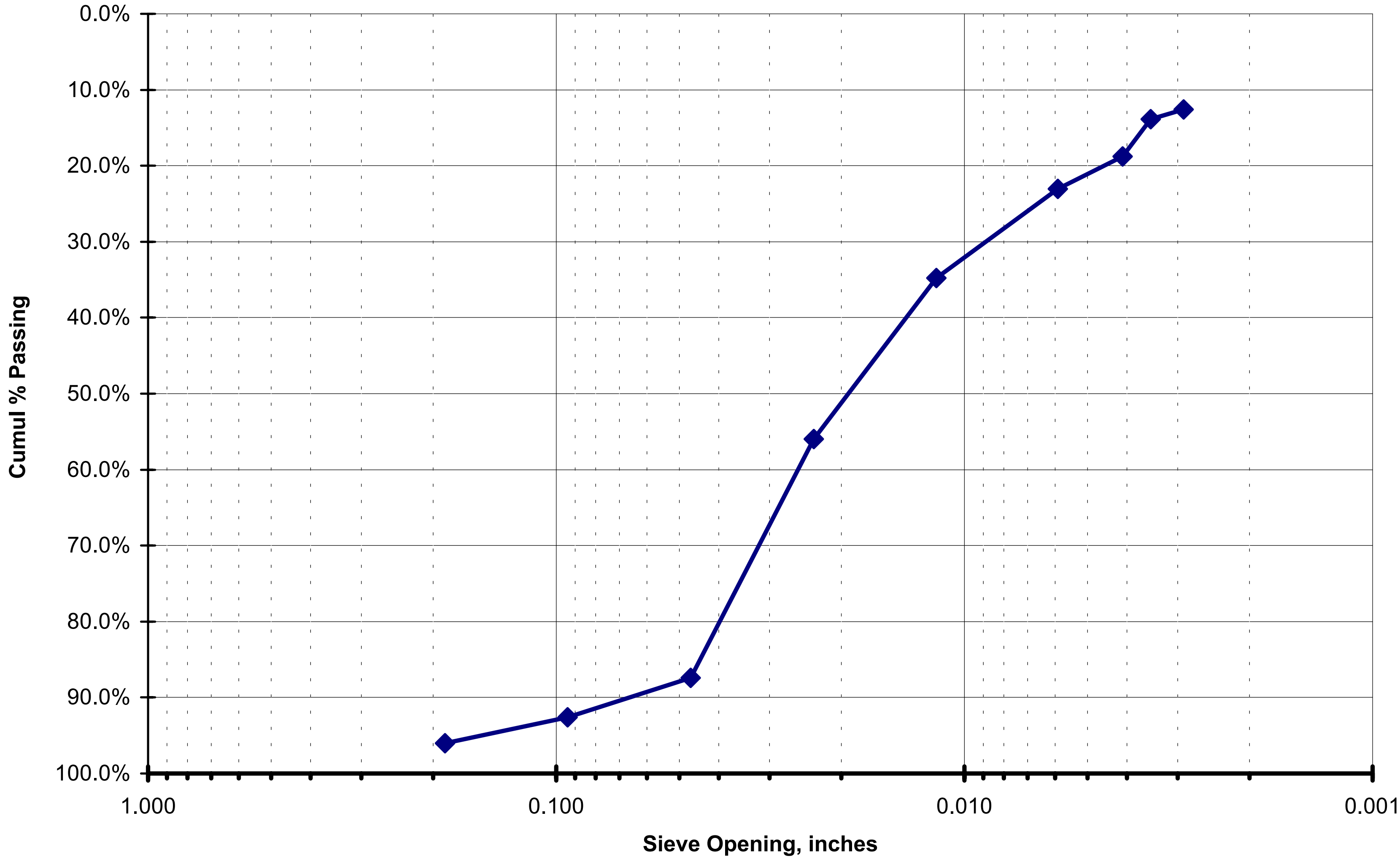
Wt. of dry sample + container	325	grams
Wt. of container	0	grams
Wt. of dry sample	325	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	13	96.0%	4.0%	13
8	2.3600	0.0937	24	92.6%	7.4%	11
16	1.1800	0.0469	41	87.4%	12.6%	17
30	0.6000	0.0234	143	56.0%	44.0%	102
50	0.3000	0.0117	212	34.8%	65.2%	69
100	0.1500	0.0059	250	23.1%	76.9%	38
140	0.1060	0.0041	264	18.8%	81.2%	14
170	0.0900	0.0035	280	13.8%	86.2%	16
200	0.0750	0.0029	284	12.6%	87.4%	4
Pan			325	0.0%	100.0%	41

Total Wt of Sample, grams	325		325
Total Wt of Sample (initial), grams	325		
% Error	0.0%		

Gravel %	7.38%	Gr+Sa/Si+Cl ratio	6.9
Sand %	80.00%		
Silts+Clays	12.62%		

Sieve Analysis



TH3 425-430.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 285-290 ft

Tested By: LK

Test Date: 10-Aug-03

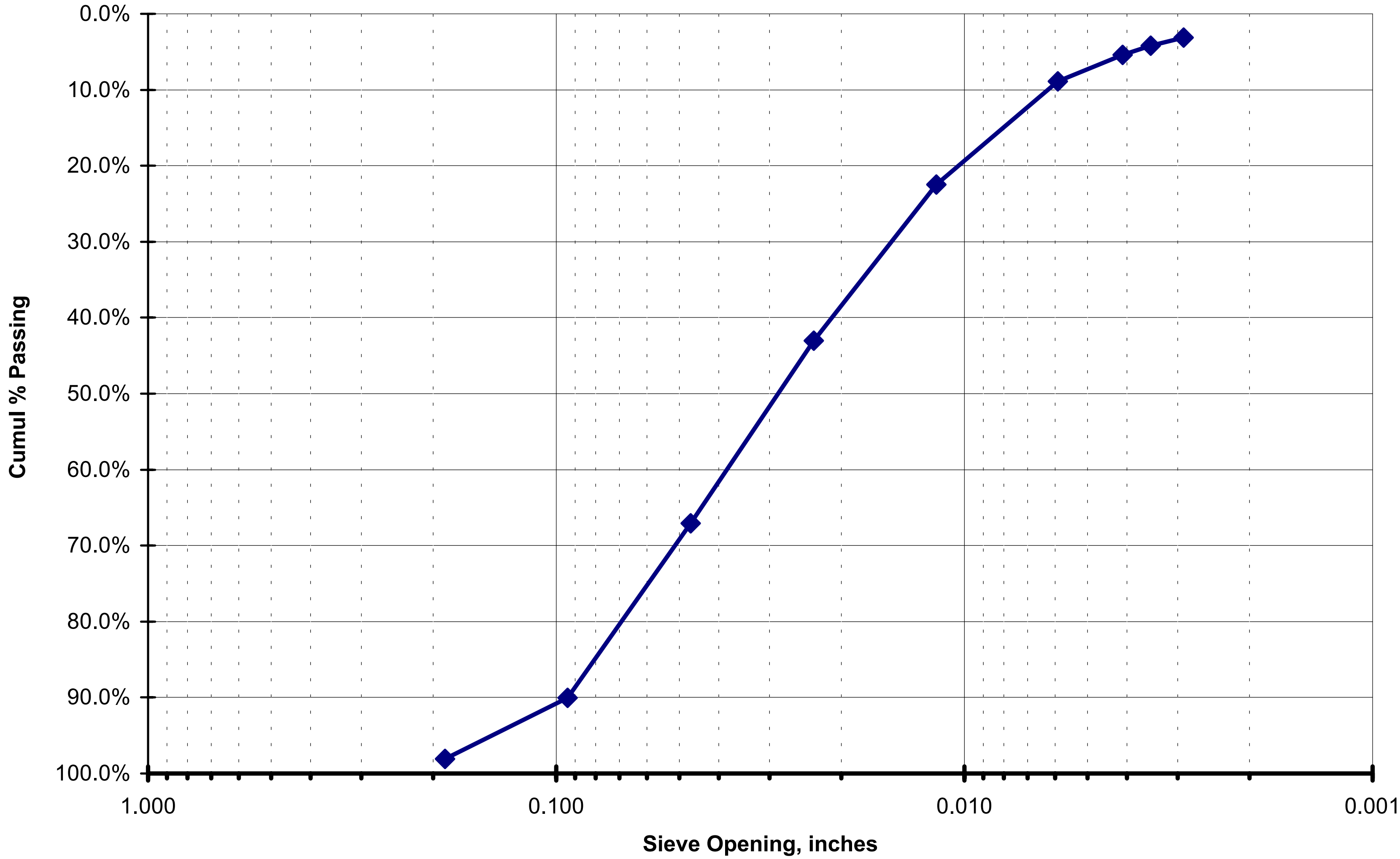
Wt. of dry sample + container	574	grams
Wt. of container	0	grams
Wt. of dry sample	574	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	11	98.1%	1.9%	11
8	2.3600	0.0937	57	90.1%	9.9%	46
16	1.1800	0.0469	189	67.1%	32.9%	132
30	0.6000	0.0234	327	43.0%	57.0%	138
50	0.3000	0.0117	445	22.5%	77.5%	118
100	0.1500	0.0059	523	8.9%	91.1%	78
140	0.1060	0.0041	543	5.4%	94.6%	20
170	0.0900	0.0035	550	4.2%	95.8%	7
200	0.0750	0.0029	556	3.1%	96.9%	6
Pan			573	0.2%	99.8%	17

Total Wt of Sample, grams	573	573
Total Wt of Sample (initial), grams	574	
% Error	0.2%	

Gravel %	9.93%	Gr+Sa/Si+Cl ratio	30.9
Sand %	86.93%		
Silts+Clays	3.14%		

Sieve Analysis



TH4 285-290.xls

Layne Christensen Company
11001 Etiwanda Avenue
Fontana, CA 92337
909-390-2833
909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 260-265 ft

Tested By: LK

Test Date: 10-Aug-03

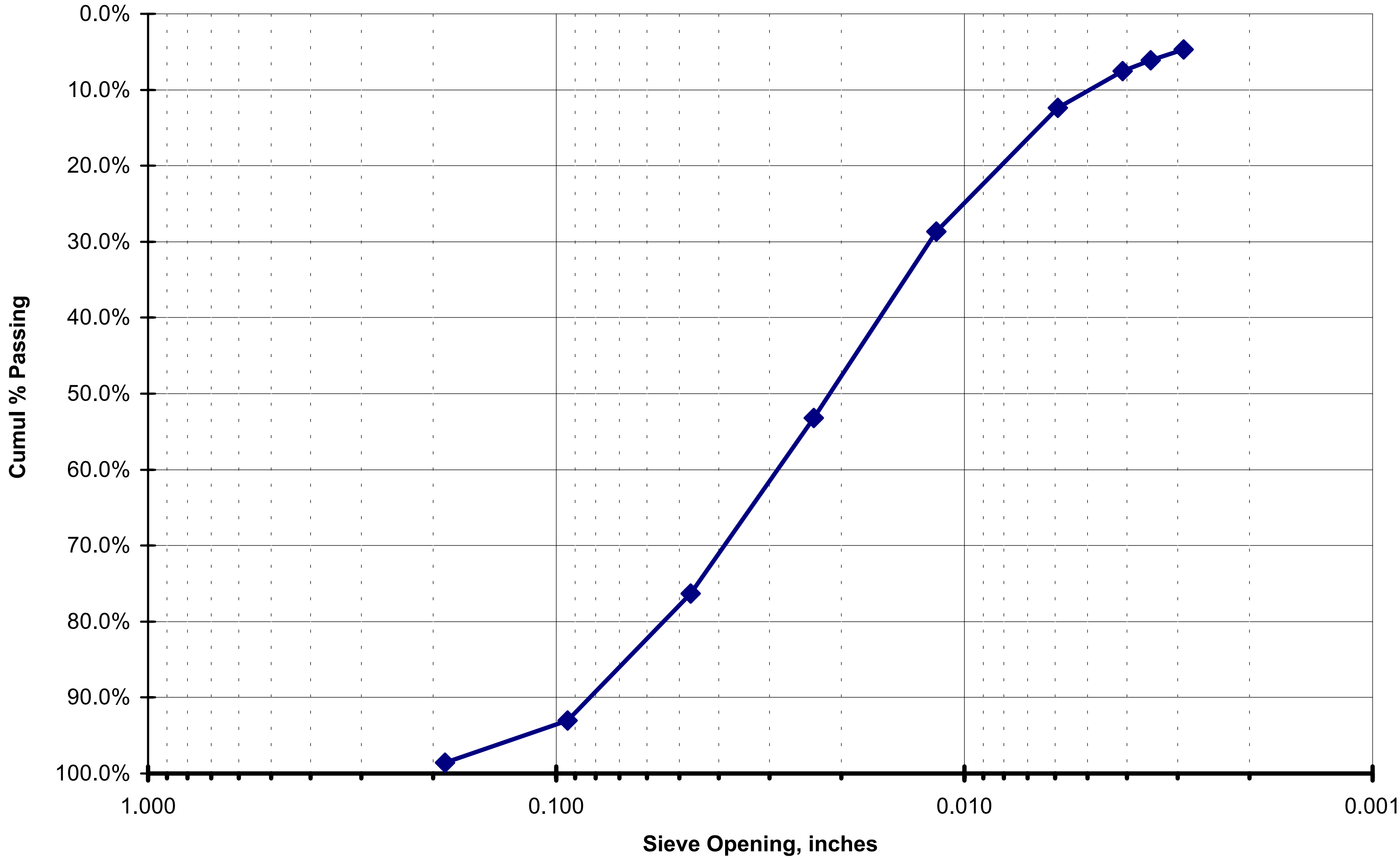
Wt. of dry sample + container	558	grams
Wt. of container	0	grams
Wt. of dry sample	558	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	8	98.6%	1.4%	8
8	2.3600	0.0937	39	93.0%	7.0%	31
16	1.1800	0.0469	132	76.3%	23.7%	93
30	0.6000	0.0234	261	53.2%	46.8%	129
50	0.3000	0.0117	398	28.7%	71.3%	137
100	0.1500	0.0059	489	12.4%	87.6%	91
140	0.1060	0.0041	516	7.5%	92.5%	27
170	0.0900	0.0035	524	6.1%	93.9%	8
200	0.0750	0.0029	532	4.7%	95.3%	8
Pan			558	0.0%	100.0%	26

Total Wt of Sample, grams	558	558
Total Wt of Sample (initial), grams	558	
% Error	0.0%	

Gravel %	6.99%	Gr+Sa/Si+Cl ratio	20.5
Sand %	88.35%		
Silts+Clays	4.66%		

Sieve Analysis



TH4 260-265.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 210-215 ft

Tested By: LK

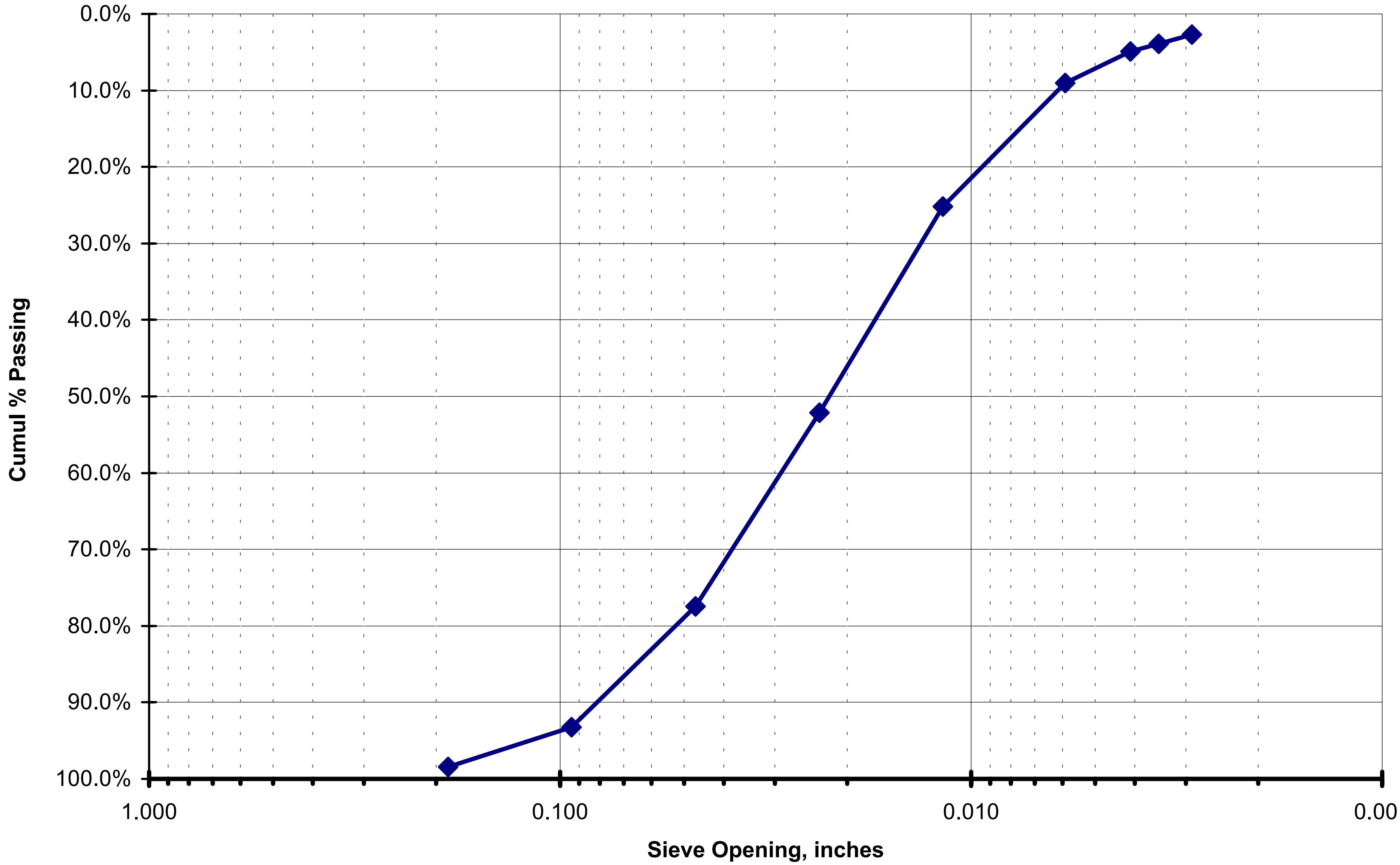
Test Date: 10-Aug-03

Wt. of dry sample + container	710	grams
Wt. of container	0	grams
Wt. of dry sample	710	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	11	98.5%	1.5%	11
8	2.3600	0.0937	48	93.2%	6.8%	37
16	1.1800	0.0469	160	77.5%	22.5%	112
30	0.6000	0.0234	340	52.1%	47.9%	180
50	0.3000	0.0117	531	25.2%	74.8%	191
100	0.1500	0.0059	646	9.0%	91.0%	115
140	0.1060	0.0041	675	4.9%	95.1%	29
170	0.0900	0.0035	682	3.9%	96.1%	7
200	0.0750	0.0029	691	2.7%	97.3%	9
Pan			710	0.0%	100.0%	19
Total Wt of Sample, grams			710			710
Total Wt of Sample (initial), grams			710			
% Error			0.0%			

Gravel %	6.76%	Gr+Sa/Si+Cl ratio	36.4
Sand %	90.56%		
Silts+Clays	2.68%		

Sieve Analysis



TH4 210-215.xls

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909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 190-195 ft

Tested By: LK

Test Date: 10-Aug-03

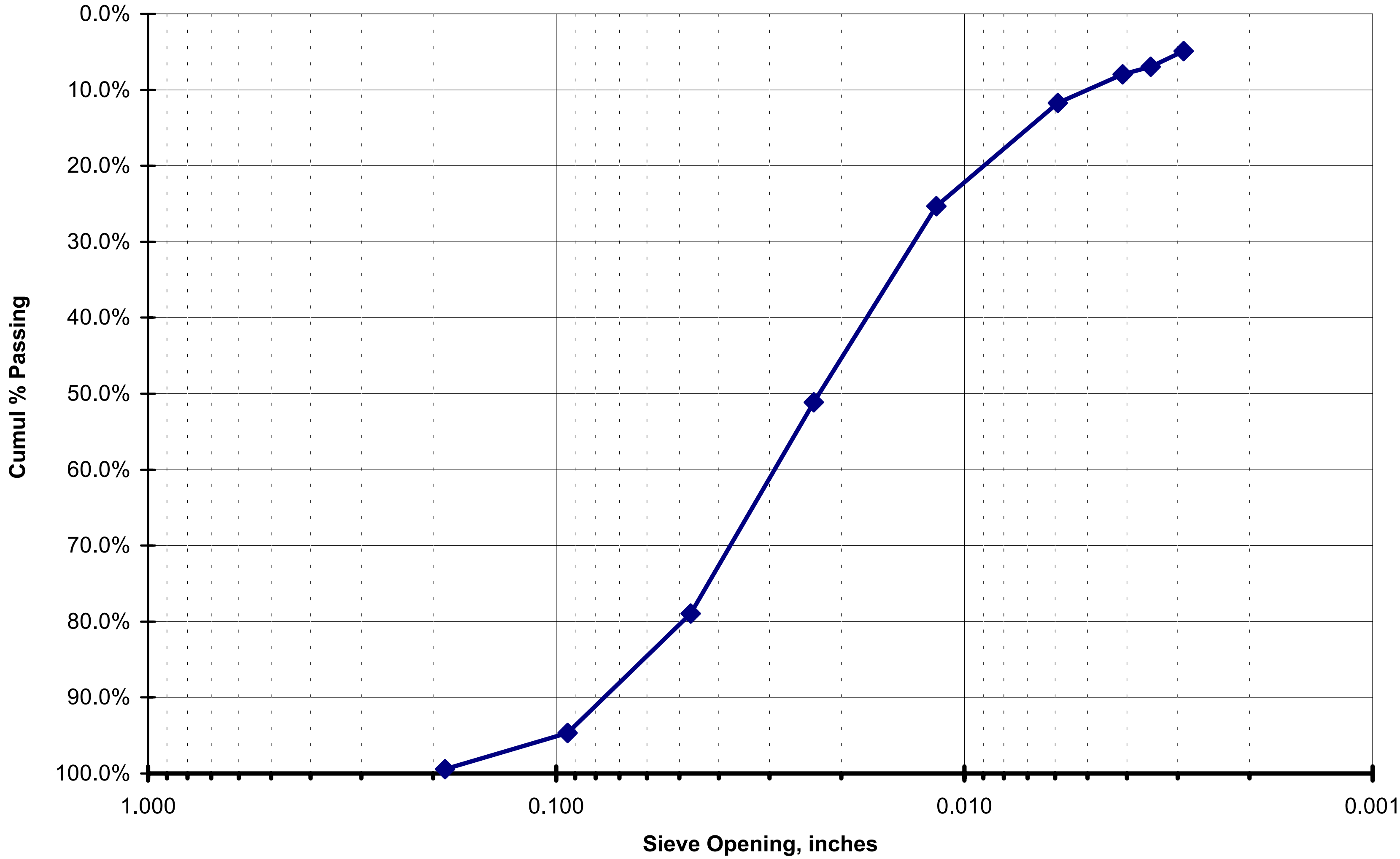
Wt. of dry sample + container	675	grams
Wt. of container	0	grams
Wt. of dry sample	675	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	4	99.4%	0.6%	4
8	2.3600	0.0937	36	94.7%	5.3%	32
16	1.1800	0.0469	142	79.0%	21.0%	106
30	0.6000	0.0234	330	51.1%	48.9%	188
50	0.3000	0.0117	504	25.3%	74.7%	174
100	0.1500	0.0059	596	11.7%	88.3%	92
140	0.1060	0.0041	621	8.0%	92.0%	25
170	0.0900	0.0035	628	7.0%	93.0%	7
200	0.0750	0.0029	642	4.9%	95.1%	14
Pan			675	0.0%	100.0%	33

Total Wt of Sample, grams	675	675
Total Wt of Sample (initial), grams	675	
% Error	0.0%	

Gravel %	5.33%	Gr+Sa/Si+Cl ratio	19.5
Sand %	89.78%		
Silts+Clays	4.89%		

Sieve Analysis



TH4 190-195.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 175-180 ft

Tested By: LK

Test Date: 10-Aug-03

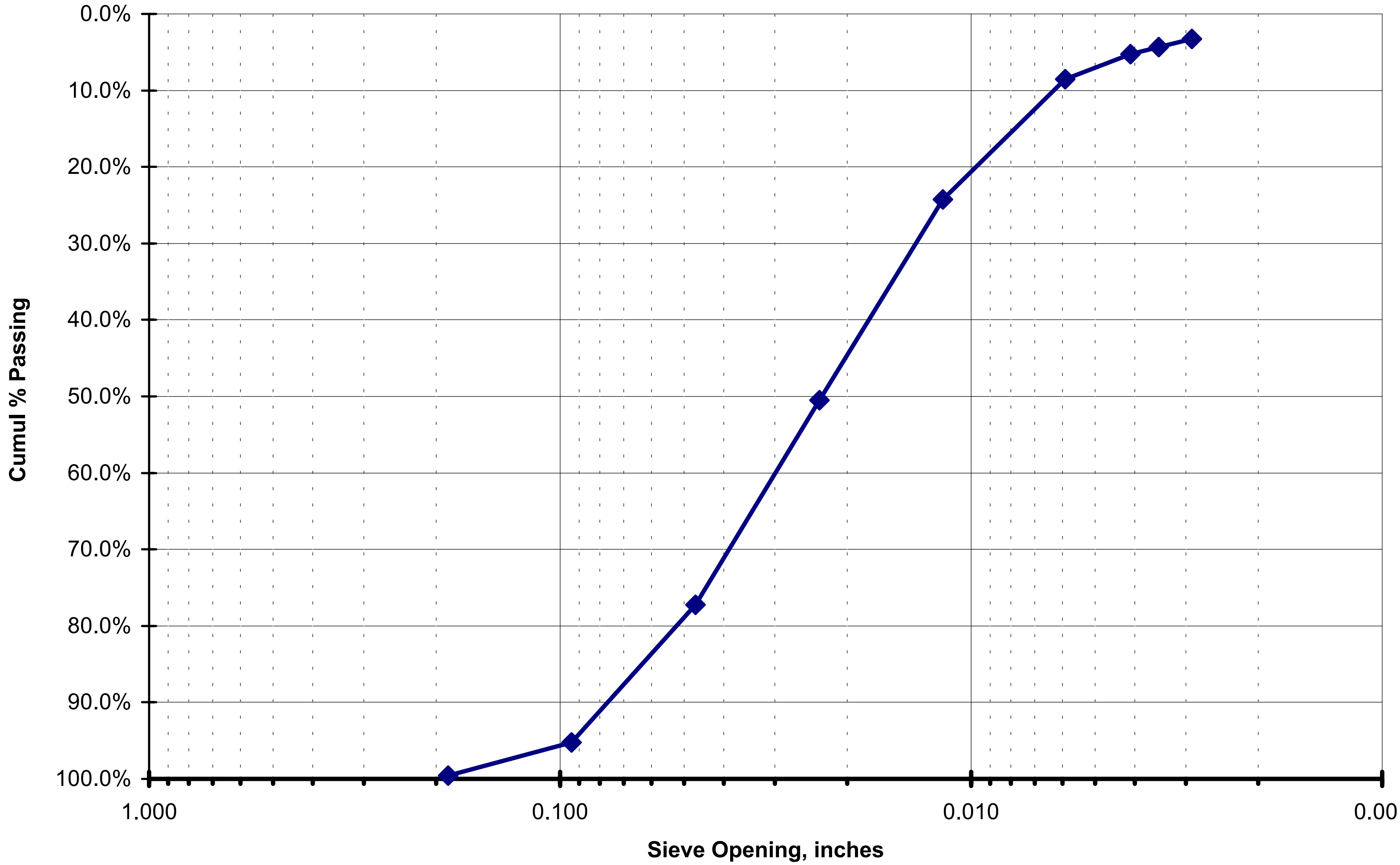
Wt. of dry sample + container	739	grams
Wt. of container	0	grams
Wt. of dry sample	739	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	3	99.6%	0.4%	3
8	2.3600	0.0937	35	95.3%	4.7%	32
16	1.1800	0.0469	168	77.3%	22.7%	133
30	0.6000	0.0234	366	50.5%	49.5%	198
50	0.3000	0.0117	560	24.2%	75.8%	194
100	0.1500	0.0059	676	8.5%	91.5%	116
140	0.1060	0.0041	700	5.3%	94.7%	24
170	0.0900	0.0035	707	4.3%	95.7%	7
200	0.0750	0.0029	715	3.2%	96.8%	8
Pan			738	0.1%	99.9%	23

Total Wt of Sample, grams	738	738
Total Wt of Sample (initial), grams	739	
% Error	0.1%	

Gravel %	4.74%	Gr+Sa/Si+Cl ratio	29.8
Sand %	92.02%		
Silts+Clays	3.25%		

Sieve Analysis



TH4 175-180.xls

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909-390-6097 FAX

MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 110-115 ft

Tested By: LK

Test Date: 10-Aug-03

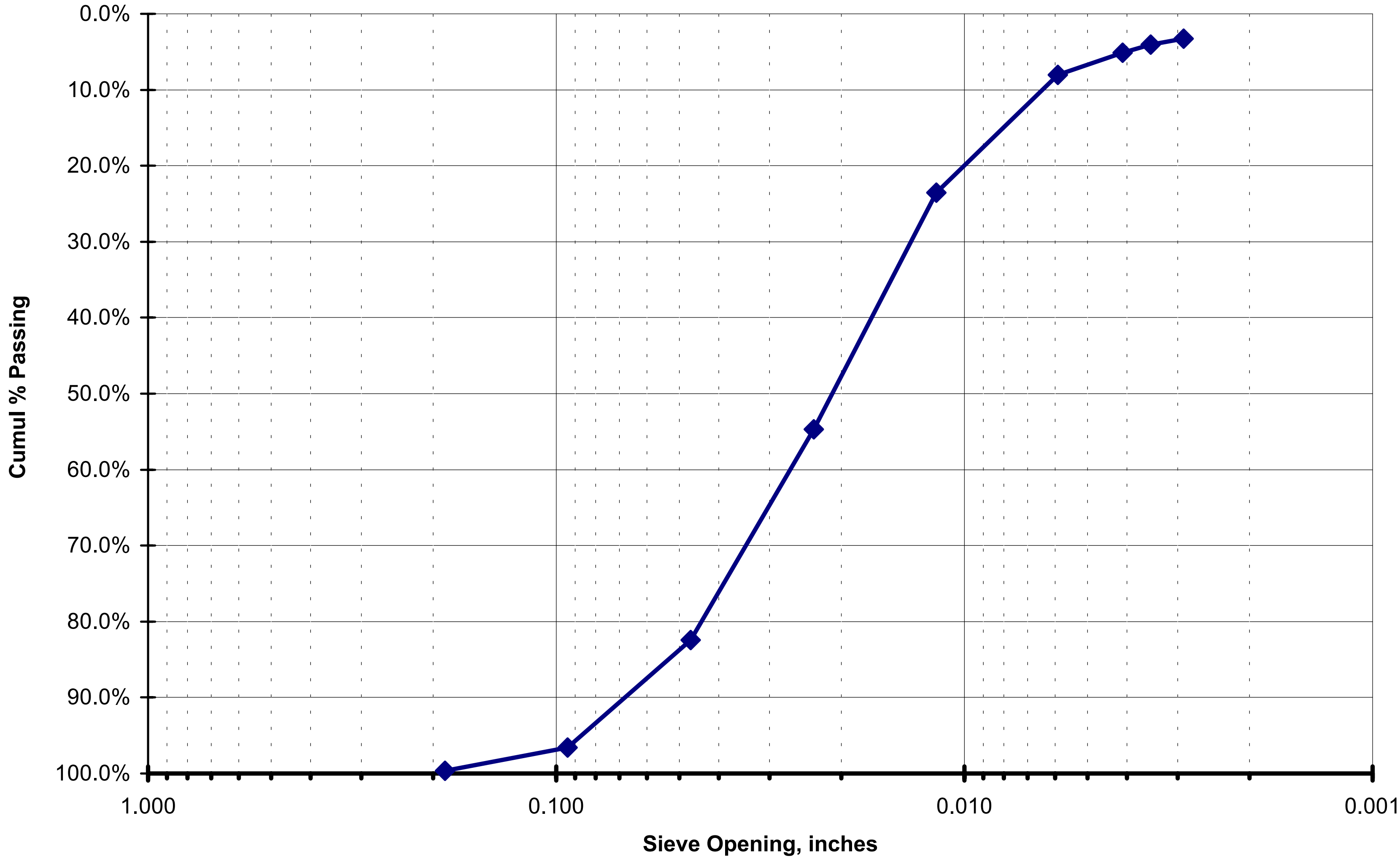
Wt. of dry sample + container	587	grams
Wt. of container	0	grams
Wt. of dry sample	587	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.7%	0.3%	2
8	2.3600	0.0937	20	96.6%	3.4%	18
16	1.1800	0.0469	103	82.5%	17.5%	83
30	0.6000	0.0234	266	54.7%	45.3%	163
50	0.3000	0.0117	449	23.5%	76.5%	183
100	0.1500	0.0059	540	8.0%	92.0%	91
140	0.1060	0.0041	557	5.1%	94.9%	17
170	0.0900	0.0035	563	4.1%	95.9%	6
200	0.0750	0.0029	568	3.2%	96.8%	5
Pan			587	0.0%	100.0%	19

Total Wt of Sample, grams	587	587
Total Wt of Sample (initial), grams	587	
% Error	0.0%	

Gravel %	3.41%	Gr+Sa/Si+Cl ratio	29.9
Sand %	93.36%		
Silts+Clays	3.24%		

Sieve Analysis



TH4 110-115.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 75-80 ft

Tested By: LK

Test Date: 10-Aug-03

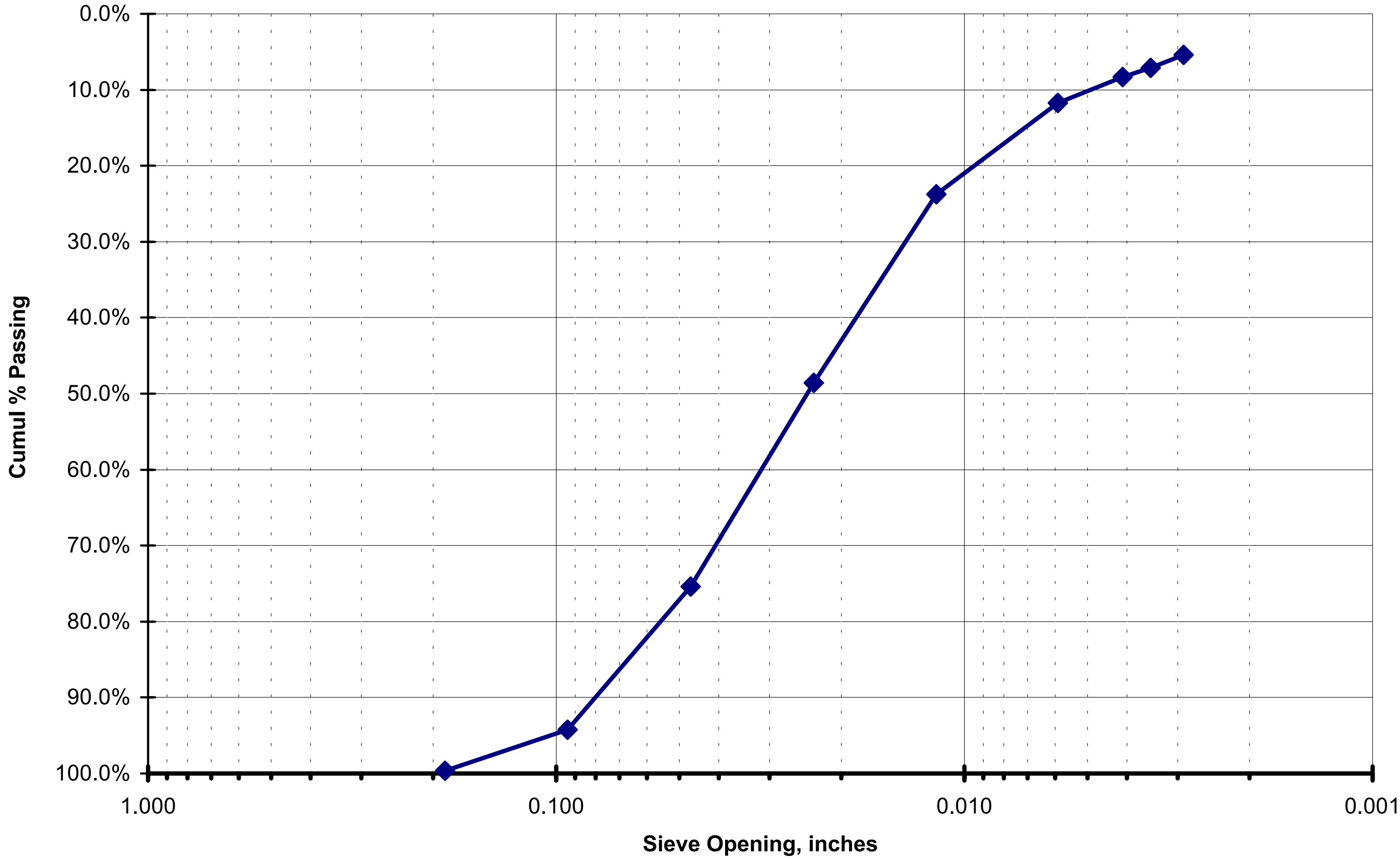
Wt. of dry sample + container	589	grams
Wt. of container	0	grams
Wt. of dry sample	589	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	2	99.7%	0.3%	2
8	2.3600	0.0937	34	94.2%	5.8%	32
16	1.1800	0.0469	145	75.4%	24.6%	111
30	0.6000	0.0234	303	48.6%	51.4%	158
50	0.3000	0.0117	449	23.8%	76.2%	146
100	0.1500	0.0059	520	11.7%	88.3%	71
140	0.1060	0.0041	540	8.3%	91.7%	20
170	0.0900	0.0035	547	7.1%	92.9%	7
200	0.0750	0.0029	557	5.4%	94.6%	10
Pan			588	0.2%	99.8%	31

Total Wt of Sample, grams	588	588
Total Wt of Sample (initial), grams	589	
% Error	0.2%	

Gravel %	5.77%	Gr+Sa/Si+Cl ratio	17.4
Sand %	88.79%		
Silts+Clays	5.43%		

Sieve Analysis



TH4 75-80.xls

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MECHANICAL SIEVE ANALYSIS

Project Name: LWDS VAN DAM

Job No.: 27-7897

Sample ID: TH-4

Depth: 360-365 ft

Tested By: LK

Test Date: 10-Aug-03

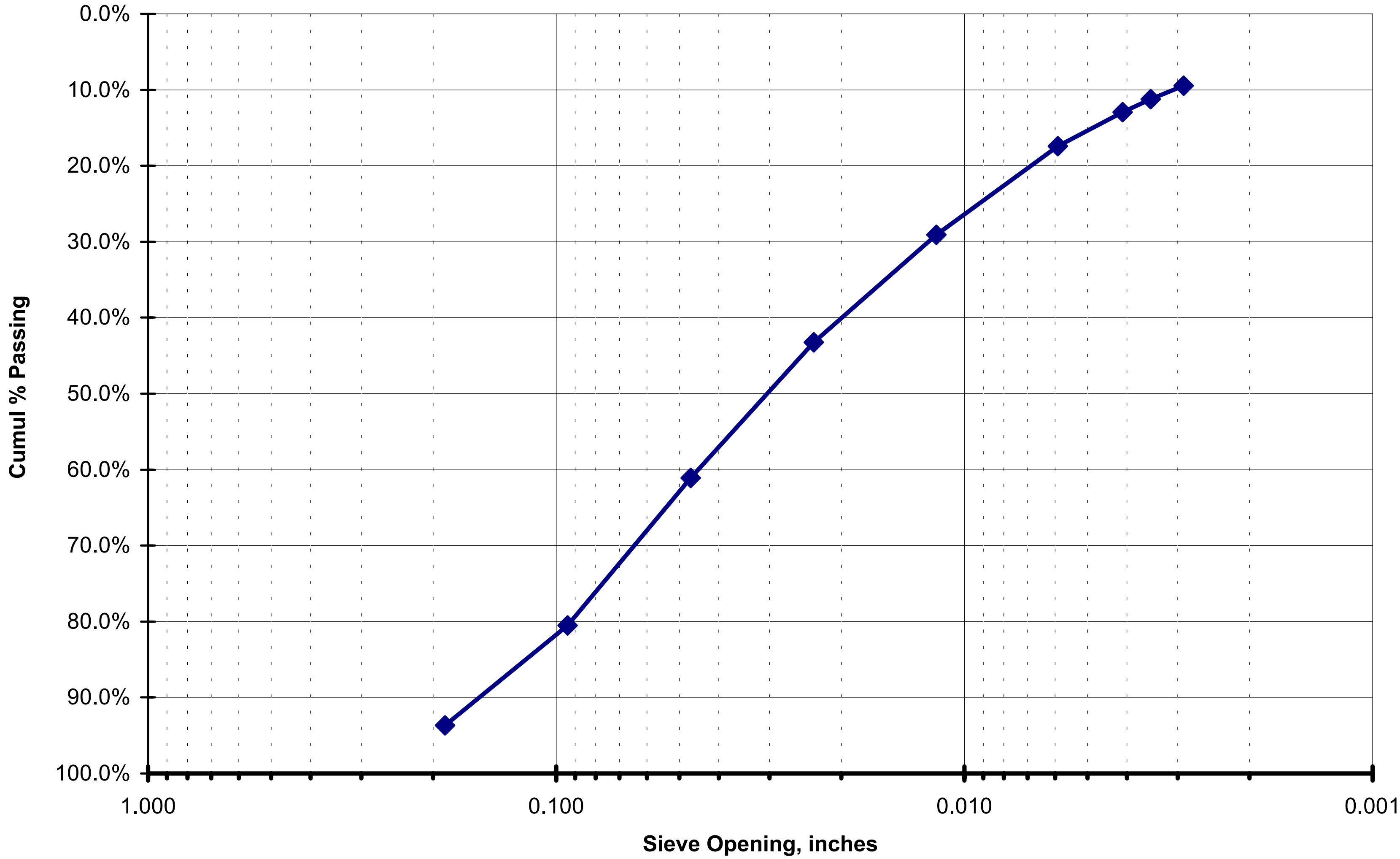
Wt. of dry sample + container	488	grams
Wt. of container	0	grams
Wt. of dry sample	488	grams

US Sieve No.	Diam (mm)	Diam (in)	Cumul wt retained (grams)	Cumul % passing	Cumul % retained	Wt. retained (grams)
4	4.7500	0.1870	31	93.6%	6.4%	31
8	2.3600	0.0937	95	80.5%	19.5%	64
16	1.1800	0.0469	190	61.1%	38.9%	95
30	0.6000	0.0234	277	43.2%	56.8%	87
50	0.3000	0.0117	346	29.1%	70.9%	69
100	0.1500	0.0059	403	17.4%	82.6%	57
140	0.1060	0.0041	425	12.9%	87.1%	22
170	0.0900	0.0035	433	11.3%	88.7%	8
200	0.0750	0.0029	442	9.4%	90.6%	9
Pan			488	0.0%	100.0%	46

Total Wt of Sample, grams	488	488
Total Wt of Sample (initial), grams	488	
% Error	0.0%	

Gravel %	19.47%	Gr+Sa/Si+Cl ratio	9.6
Sand %	71.11%		
Silts+Clays	9.43%		

Sieve Analysis



TH4 360-365.xls

LABORATORY ANALYTICAL DATA SHEETS

Del Mar Analytical

2852 Alton Ave., Irvine CA 92606 (949) 261-1022 FAX (949) 261-1228
1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (949) 370-1046
9484 Chesapeake Dr., Suite 805, San Diego, CA 92123 (858) 505-8596 FAX (858) 505-9689
9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

LABORATORY REPORT

Prepared For: Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project: Antelope Valley

Sampled: 07/25/03
Received: 07/25/03
Issued: 08/18/03

CA ELAP #1169

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical. This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

SUBCONTRACTED: Refer to the last page for specific subcontract laboratory information included in this report.

LABORATORY ID	CLIENT ID	MATRIX
CMG0155-01	Van Dam #3 438'	Water

Jeanne Shoulder

Del Mar Analytical, Colton
Jeanne Shoulder
Project Manager

Del Mar Analytical

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: ug/l								
Aluminum	EPA 200.7	3G28059	50	**24000**	1	7/28/2003	8/4/2003	
Antimony	EPA 200.8	3H11042	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8	3H11042	1.0	**5.4**	1	8/11/2003	8/11/2003	
Barium	EPA 200.7	3G28059	10	**180**	1	7/28/2003	7/29/2003	
Beryllium	EPA 200.8	3H11042	0.50	**0.67**	1	8/11/2003	8/11/2003	
Boron	EPA 200.7	3G28059	50	ND	1	7/28/2003	7/29/2003	
Cadmium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7	3G28059	100	**31000**	1	7/28/2003	7/29/2003	
Chromium	EPA 200.7	3G28059	5.0	**57**	1	7/28/2003	7/29/2003	
Copper	EPA 200.7	3G28059	10	**44**	1	7/28/2003	7/29/2003	
Iron	EPA 200.7	3G28059	40	**35000**	1	7/28/2003	7/29/2003	
Lead	EPA 200.7	3G28059	5.0	**9.3**	1	7/28/2003	7/29/2003	
Magnesium	EPA 200.7	3G28059	20	**13000**	1	7/28/2003	8/1/2003	
Manganese	EPA 200.7	3G28059	20	**620**	1	7/28/2003	7/28/2003	
Mercury	EPA 245.1	3G30061	0.20	**1.3**	1	7/30/2003	7/30/2003	
Nickel	EPA 200.7	3G28059	10	**43**	1	7/28/2003	7/29/2003	
Potassium	EPA 200.7	3G28059	500	**5100**	1	7/28/2003	7/29/2003	
Selenium	EPA 200.7	3G28059	5.0	ND	1	7/28/2003	7/29/2003	
Silicon	EPA 200.7	3G28059	51	**60000**	1	7/28/2003	7/29/2003	
Silver	EPA 200.7	3G28059	10	ND	1	7/28/2003	7/29/2003	
Sodium	EPA 200.7	3G28059	500	**36000**	1	7/28/2003	7/29/2003	
Thallium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7	3G28059	20	**67**	1	7/28/2003	7/29/2003	

Del Mar Analytical, Colton
Jeanne Shoulder
Project Manager

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Layne Geosciences
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Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

DISSOLVED METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: ug/l								
Aluminum	EPA 200.7-Diss	3H14053	50	ND	1	8/14/2003	8/15/2003	
Antimony	EPA 200.8-Diss	3H11045	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8-Diss	3H11045	1.0	ND	1	8/11/2003	8/11/2003	
Barium	EPA 200.7-Diss	3H14053	10	**36**	1	8/14/2003	8/15/2003	
Beryllium	EPA 200.8-Diss	3H11045	0.50	ND	1	8/11/2003	8/11/2003	
Boron	EPA 200.7-Diss	3H14053	50	ND	1	8/14/2003	8/15/2003	
Cadmium	EPA 200.8-Diss	3H11045	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7-Diss	3H14053	100	**19000**	1	8/14/2003	8/15/2003	
Chromium	EPA 200.7-Diss	3H14053	5.0	ND	1	8/14/2003	8/15/2003	
Copper	EPA 200.7-Diss	3H14053	10	ND	1	8/14/2003	8/15/2003	
Iron	EPA 200.7-Diss	3H14053	40	ND	1	8/14/2003	8/15/2003	
Lead	EPA 200.7-Diss	3H14053	5.0	ND	1	8/14/2003	8/15/2003	
Magnesium	EPA 200.7-Diss	3H14053	20	**2300**	1	8/14/2003	8/15/2003	
Manganese	EPA 200.7-Diss	3H14053	20	**57**	1	8/14/2003	8/15/2003	
Mercury	EPA 245.1-Diss	3H13076	0.20	ND	1	8/13/2003	8/13/2003	
Nickel	EPA 200.7-Diss	3H14053	10	ND	1	8/14/2003	8/15/2003	
Potassium	EPA 200.7-Diss	3H14053	500	**2200**	1	8/14/2003	8/15/2003	
Selenium	EPA 200.7-Diss	3H14053	5.0	ND	1	8/14/2003	8/15/2003	
Silicon	EPA 200.7-Diss	3H14053	51	**8700**	1	8/14/2003	8/15/2003	
Silver	EPA 200.7-Diss	3H14053	10	ND	1	8/14/2003	8/15/2003	
Sodium	EPA 200.7-Diss	3H14053	500	**34000**	1	8/14/2003	8/15/2003	
Thallium	EPA 200.8-Diss	3H11045	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7-Diss	3H14053	20	ND	1	8/14/2003	8/15/2003	

Del Mar Analytical, Colton
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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: Antelope Valley Report Number: CMG0155	Sampled: 07/25/03 Received: 07/25/03

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: °C								
Temperature	EPA 170.1	3H06051	NA	**28**	1	7/24/2003	7/24/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: Color Units								
Color	SM2120B	3G26035	1.0	**19**	1	7/26/2003	7/26/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: mg/l								
Alkalinity as CaCO3	SM2320B	3G31105	2.0	**110**	1	7/31/2003	7/31/2003	
Bicarbonate Alkalinity as CaCO3	SM2320B	3G31105	2.0	**100**	1	7/31/2003	7/31/2003	
Carbonate Alkalinity as CaCO3	SM2320B	3G31105	2.0	**8.0**	1	7/31/2003	7/31/2003	
Hydroxide Alkalinity as CaCO3	SM2320B	3G31105	2.0	ND	1	7/31/2003	7/31/2003	
Ammonia-N	EPA 350.3	3G28048	0.50	ND	1	7/28/2003	7/28/2003	
Bromide	EPA 300.0	3G25037	0.50	ND	1	7/25/2003	7/25/2003	
Chloride	EPA 300.0	3G25037	0.50	**8.2**	1	7/25/2003	7/25/2003	
Chromium VI	EPA 218.6	3G25073	0.0010	ND	1	7/25/2003	7/25/2003	
Total Cyanide	SM4500-CN-C,E	3G28061	0.025	ND	1	7/28/2003	7/28/2003	
Fluoride	EPA 300.0	3G28039	0.50	ND	1	7/28/2003	7/28/2003	
Hardness (as CaCO3)	SM2340B	3G28059	1.0	**130**	1	7/28/2003	7/29/2003	
Nitrate-NO3	EPA 300.0	3G25037	0.50	**9.0**	1	7/25/2003	7/25/2003	
Nitrite-N	EPA 300.0	3G25037	0.15	ND	1	7/25/2003	7/25/2003	
Nitrate/Nitrite-N	EPA 300.0	3G25037	0.15	**2.0**	1	7/25/2003	7/25/2003	
Phosphorus	EPA 365.3	3G30049	0.050	**0.15**	1	7/30/2003	7/30/2003	
Sulfate	EPA 300.0	3G25037	0.50	**14**	1	7/25/2003	7/25/2003	
Surfactants (MBAS)	SM5540-C	3G25064	0.40	ND	4	7/25/2003	7/25/2003	M2, RL-1
Total Dissolved Solids	EPA 160.1	3G28080	10	**200**	1	7/28/2003	7/28/2003	
Total Organic Carbon	EPA 415.1	3G30056	1.0	**2.1**	1	7/30/2003	7/30/2003	
Total Suspended Solids	EPA 160.2	3G28060	10	**460**	1	7/28/2003	7/28/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: NTU								
Turbidity	EPA 180.1	3G26036	50	**990**	50	7/26/2003	7/26/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: pH Units								
pH	EPA 150.1	3G25077	NA	**8.05**	1	7/25/2003	7/25/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: T.O.N.								
Odor	SM2150B	3G25079	1.0	ND	1	7/25/2003	7/25/2003	H3

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Fontana, CA 92337
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INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: umhos/cm								
Specific Conductance	EPA 120.1	3G28079	1.0	**260**	1	7/28/2003	7/28/2003	

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LANGLIER SATURATION INDEX

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: SI Units								
Langlier Index	SM 2330B	3H06052	0.010	**0.37**	1	8/6/2003	8/6/2003	

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Sampled: 07/25/03
Received: 07/25/03

SHORT HOLD TIME DETAIL REPORT

	Hold Time (in days)	Date/Time Sampled	Date/Time Received	Date/Time Extracted	Date/Time Analyzed
Sample ID: Van Dam #3 438' (CMG0155-01) - Water					
EPA 150.1	1	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:15	07/25/2003 21:20
EPA 170.1	1	07/25/2003 13:25	07/25/2003 16:00	07/24/2003 13:25	07/24/2003 13:25
EPA 180.1	2	07/25/2003 13:25	07/25/2003 16:00	07/26/2003 12:00	07/26/2003 13:00
EPA 218.6	1	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 18:40	07/25/2003 19:25
EPA 300.0	2	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:00	07/25/2003 20:51
SM2120B	2	07/25/2003 13:25	07/25/2003 16:00	07/26/2003 12:00	07/26/2003 13:00
SM2150B	1	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:00	07/25/2003 20:30
SM5540-C	2	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:00	07/25/2003 21:00

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Report Number: CMG0155

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Received: 07/25/03

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28059 Extracted: 07/28/03										
Blank Analyzed: 08/04/03 (3G28059-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							
LCS Analyzed: 08/04/03 (3G28059-BS1)										
Aluminum	540	50	ug/l	500		108	85-115			
Barium	524	10	ug/l	500		105	85-115			
Boron	513	50	ug/l	500		103	85-115			
Calcium	2820	100	ug/l	2500		113	85-115			
Chromium	524	5.0	ug/l	500		105	85-115			
Copper	486	10	ug/l	500		97	85-115			
Iron	526	40	ug/l	500		105	85-115			
Lead	521	5.0	ug/l	500		104	85-115			
Magnesium	2840	20	ug/l	2500		114	85-115			
Manganese	513	20	ug/l	500		103	85-115			
Nickel	508	10	ug/l	500		102	85-115			
Potassium	5160	500	ug/l	5000		103	85-115			
Selenium	509	5.0	ug/l	500		102	85-115			
Silicon	2570	51	ug/l	2500		103	85-115			
Silver	258	10	ug/l	250		103	85-115			
Sodium	2580	500	ug/l	2500		103	85-115			

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Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28059 Extracted: 07/28/03										
LCS Analyzed: 07/29/03 (3G28059-BS1)										
Zinc	504	20	ug/l	500		101	85-115			
Matrix Spike Analyzed: 08/04/03 (3G28059-MS1)					**Source: IMG1369-01**					
Aluminum	593	50	ug/l	500	ND	119	70-130			
Barium	527	10	ug/l	500	26	100	70-130			
Boron	674	50	ug/l	500	160	103	70-130			
Calcium	46600	100	ug/l	2500	44000	104	70-130			
Chromium	509	5.0	ug/l	500	ND	102	70-130			
Copper	486	10	ug/l	500	4.6	96	70-130			
Iron	527	40	ug/l	500	18	102	70-130			
Lead	505	5.0	ug/l	500	ND	101	70-130			
Magnesium	13400	20	ug/l	2500	10000	136	70-130			*M1*
Manganese	497	20	ug/l	500	ND	99	70-130			
Nickel	473	10	ug/l	500	ND	95	70-130			
Potassium	8600	500	ug/l	5000	3200	108	70-130			
Selenium	506	5.0	ug/l	500	4.8	100	70-130			
Silicon	16000	51	ug/l	2500	14000	80	70-130			
Silver	249	10	ug/l	250	ND	100	70-130			
Sodium	47400	500	ug/l	2500	44000	136	70-130			*M-HA*
Zinc	505	20	ug/l	500	9.4	99	70-130			
Matrix Spike Dup Analyzed: 08/04/03 (3G28059-MSD1)					**Source: IMG1369-01**					
Aluminum	582	50	ug/l	500	ND	116	70-130	2	20	
Barium	531	10	ug/l	500	26	101	70-130	1	20	
Boron	682	50	ug/l	500	160	104	70-130	1	20	
Calcium	46700	100	ug/l	2500	44000	108	70-130	0	20	
Chromium	513	5.0	ug/l	500	ND	103	70-130	1	20	
Copper	490	10	ug/l	500	4.6	97	70-130	1	20	
Iron	531	40	ug/l	500	18	103	70-130	1	20	
Lead	510	5.0	ug/l	500	ND	102	70-130	1	20	
Magnesium	13300	20	ug/l	2500	10000	132	70-130	1	20	*M1*
Manganese	503	20	ug/l	500	ND	101	70-130	1	20	
Nickel	477	10	ug/l	500	ND	95	70-130	1	20	
Potassium	8720	500	ug/l	5000	3200	110	70-130	1	20	
Selenium	519	5.0	ug/l	500	4.8	103	70-130	3	20	
Silicon	16100	51	ug/l	2500	14000	84	70-130	1	20	

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28059 Extracted: 07/28/03										
Matrix Spike Dup Analyzed: 07/29/03 (3G28059-MSD1)					**Source: IMG1369-01**					
Silver	250	10	ug/l	250	ND	100	70-130	0	20	
Sodium	47600	500	ug/l	2500	44000	144	70-130	0	20	*M-HA*
Zinc	510	20	ug/l	500	9.4	100	70-130	1	20	
Batch: 3G30061 Extracted: 07/30/03										
Blank Analyzed: 07/30/03 (3G30061-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 07/30/03 (3G30061-BS1)										
Mercury	8.55	0.20	ug/l	8.00		107	85-115			
Matrix Spike Analyzed: 07/30/03 (3G30061-MS1)					**Source: IMG1501-02**					
Mercury	7.39	0.20	ug/l	8.00	ND	92	70-130			
Matrix Spike Dup Analyzed: 07/30/03 (3G30061-MSD1)					**Source: IMG1501-02**					
Mercury	7.28	0.20	ug/l	8.00	ND	91	70-130	1	20	
Batch: 3H11042 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11042-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11042 Extracted: 08/11/03										
LCS Analyzed: 08/11/03 (3H11042-BS1)										
Antimony	90.5	2.0	ug/l	80.0		113	85-115			
Arsenic	88.5	1.0	ug/l	80.0		111	85-115			
Beryllium	83.0	0.50	ug/l	80.0		104	85-115			
Cadmium	85.1	1.0	ug/l	80.0		106	85-115			
Thallium	84.2	1.0	ug/l	80.0		105	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11042-MS1)					**Source: IMH0411-01**					
Antimony	82.3	2.0	ug/l	80.0	0.49	102	70-130			
Arsenic	119	1.0	ug/l	80.0	34	106	70-130			
Beryllium	74.8	0.50	ug/l	80.0	ND	94	70-130			
Cadmium	71.5	1.0	ug/l	80.0	0.092	89	70-130			
Thallium	79.0	1.0	ug/l	80.0	ND	99	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11042-MSD1)					**Source: IMH0411-01**					
Antimony	82.2	2.0	ug/l	80.0	0.49	102	70-130	0	20	
Arsenic	119	1.0	ug/l	80.0	34	106	70-130	0	20	
Beryllium	76.2	0.50	ug/l	80.0	ND	95	70-130	2	20	
Cadmium	71.4	1.0	ug/l	80.0	0.092	89	70-130	0	20	
Thallium	79.2	1.0	ug/l	80.0	ND	99	70-130	0	20	

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METHOD BLANK/QC DATA

DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11045 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11045-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							
LCS Analyzed: 08/11/03 (3H11045-BS1)										
Antimony	88.9	2.0	ug/l	80.0		111	85-115			
Arsenic	85.3	1.0	ug/l	80.0		107	85-115			
Beryllium	88.1	0.50	ug/l	80.0		110	85-115			
Cadmium	84.7	1.0	ug/l	80.0		106	85-115			
Thallium	75.6	1.0	ug/l	80.0		94	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11045-MS1)					**Source: CMG0155-01**					
Antimony	88.4	2.0	ug/l	80.0	0.22	110	70-130			
Arsenic	87.0	1.0	ug/l	80.0	0.77	108	70-130			
Beryllium	87.0	0.50	ug/l	80.0	ND	109	70-130			
Cadmium	81.2	1.0	ug/l	80.0	ND	102	70-130			
Thallium	80.0	1.0	ug/l	80.0	ND	100	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11045-MSD1)					**Source: CMG0155-01**					
Antimony	87.8	2.0	ug/l	80.0	0.22	109	70-130	1	20	
Arsenic	86.7	1.0	ug/l	80.0	0.77	107	70-130	0	20	
Beryllium	86.6	0.50	ug/l	80.0	ND	108	70-130	1	20	
Cadmium	81.0	1.0	ug/l	80.0	ND	101	70-130	0	20	
Thallium	81.1	1.0	ug/l	80.0	ND	101	70-130	1	20	

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DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H13076 Extracted: 08/13/03										
Blank Analyzed: 08/13/03 (3H13076-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 08/13/03 (3H13076-BS1)										
Mercury	8.25	0.20	ug/l	8.00		103	85-115			
Matrix Spike Analyzed: 08/13/03 (3H13076-MS1)					**Source: IMH0074-01**					
Mercury	7.75	0.20	ug/l	8.00	ND	97	70-130			
Matrix Spike Dup Analyzed: 08/13/03 (3H13076-MSD1)					**Source: IMH0074-01**					
Mercury	7.80	0.20	ug/l	8.00	ND	98	70-130	1	20	
Batch: 3H14053 Extracted: 08/14/03										
Blank Analyzed: 08/15/03 (3H14053-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							

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Batch: 3H14053 Extracted: 08/14/03										
LCS Analyzed: 08/15/03 (3H14053-BS1)										
Aluminum	498	50	ug/l	500		100	85-115			
Barium	533	10	ug/l	500		107	85-115			
Boron	490	50	ug/l	500		98	85-115			
Calcium	2500	100	ug/l	2500		100	85-115			
Chromium	502	5.0	ug/l	500		100	85-115			
Copper	500	10	ug/l	500		100	85-115			
Iron	510	40	ug/l	500		102	85-115			
Lead	499	5.0	ug/l	500		100	85-115			
Magnesium	2520	20	ug/l	2500		101	85-115			
Manganese	534	20	ug/l	500		107	85-115			
Nickel	511	10	ug/l	500		102	85-115			
Potassium	5150	500	ug/l	5000		103	85-115			
Selenium	505	5.0	ug/l	500		101	85-115			
Silicon	2710	51	ug/l	2500		108	85-115			
Silver	254	10	ug/l	250		102	85-115			
Sodium	2590	500	ug/l	2500		104	85-115			
Zinc	494	20	ug/l	500		99	85-115			
Matrix Spike Analyzed: 08/15/03 (3H14053-MS1)					**Source: CMG0155-01**					
Aluminum	538	50	ug/l	500	ND	108	70-130			
Barium	568	10	ug/l	500	36	106	70-130			
Boron	525	50	ug/l	500	27	100	70-130			
Calcium	21100	100	ug/l	2500	19000	84	70-130			
Chromium	504	5.0	ug/l	500	ND	101	70-130			
Copper	536	10	ug/l	500	4.0	106	70-130			
Iron	512	40	ug/l	500	ND	102	70-130			
Lead	509	5.0	ug/l	500	ND	102	70-130			
Magnesium	4740	20	ug/l	2500	2300	98	70-130			
Manganese	593	20	ug/l	500	57	107	70-130			
Nickel	516	10	ug/l	500	ND	103	70-130			
Potassium	7590	500	ug/l	5000	2200	108	70-130			
Selenium	511	5.0	ug/l	500	ND	102	70-130			
Silicon	11200	51	ug/l	2500	8700	100	70-130			
Silver	258	10	ug/l	250	ND	103	70-130			
Sodium	36100	500	ug/l	2500	34000	84	70-130			

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14053 Extracted: 08/14/03										
Matrix Spike Analyzed: 08/15/03 (3H14053-MS1)					**Source: CMG0155-01**					
Zinc	507	20	ug/l	500	ND	101	70-130			
Matrix Spike Dup Analyzed: 08/15/03 (3H14053-MSD1)					**Source: CMG0155-01**					
Aluminum	517	50	ug/l	500	ND	103	70-130	4	20	
Barium	566	10	ug/l	500	36	106	70-130	0	20	
Boron	522	50	ug/l	500	27	99	70-130	1	20	
Calcium	21100	100	ug/l	2500	19000	84	70-130	0	20	
Chromium	501	5.0	ug/l	500	ND	100	70-130	1	20	
Copper	540	10	ug/l	500	4.0	107	70-130	1	20	
Iron	513	40	ug/l	500	ND	103	70-130	0	20	
Lead	507	5.0	ug/l	500	ND	101	70-130	0	20	
Magnesium	4730	20	ug/l	2500	2300	97	70-130	0	20	
Manganese	574	20	ug/l	500	57	103	70-130	3	20	
Nickel	515	10	ug/l	500	ND	103	70-130	0	20	
Potassium	7600	500	ug/l	5000	2200	108	70-130	0	20	
Selenium	516	5.0	ug/l	500	ND	103	70-130	1	20	
Silicon	11100	51	ug/l	2500	8700	96	70-130	1	20	
Silver	256	10	ug/l	250	ND	102	70-130	1	20	
Sodium	36000	500	ug/l	2500	34000	80	70-130	0	20	
Zinc	505	20	ug/l	500	ND	101	70-130	0	20	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G25037 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25037-BLK1)										
Bromide	ND	0.50	mg/l							
Chloride	ND	0.50	mg/l							
Nitrate-NO3	ND	0.50	mg/l							
Nitrite-N	ND	0.15	mg/l							
Nitrate/Nitrite-N	ND	0.15	mg/l							
Sulfate	ND	0.50	mg/l							
LCS Analyzed: 07/25/03 (3G25037-BS1)										
Bromide	5.00	0.50	mg/l	5.00		100	90-110			
Chloride	4.84	0.50	mg/l	5.00		97	90-110			*M3*
Nitrate-NO3	5.00	0.50	mg/l	5.00		100	90-110			
Nitrite-N	1.54	0.15	mg/l	1.52		101	90-110			
Sulfate	9.52	0.50	mg/l	10.0		95	90-110			
Matrix Spike Analyzed: 07/25/03 (3G25037-MS1)					**Source: IMG1324-12**					
Bromide	6.35	0.50	mg/l	5.00	1.2	103	80-120			
Nitrate-NO3	5.01	0.50	mg/l	5.00	ND	100	80-120			
Nitrite-N	2.01	0.15	mg/l	1.52	ND	132	80-120			*M1*
Sulfate	10.6	0.50	mg/l	10.0	1.5	91	80-120			
Matrix Spike Dup Analyzed: 07/25/03 (3G25037-MSD1)					**Source: IMG1324-12**					
Bromide	6.37	0.50	mg/l	5.00	1.2	103	80-120	0	20	
Nitrate-NO3	5.19	0.50	mg/l	5.00	ND	104	80-120	4	20	
Nitrite-N	2.01	0.15	mg/l	1.52	ND	132	80-120	0	20	*M1*
Sulfate	10.8	0.50	mg/l	10.0	1.5	93	80-120	2	20	
Batch: 3G25064 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25064-BLK1)										
Surfactants (MBAS)	ND	0.10	mg/l							

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Batch: 3G25064 Extracted: 07/25/03										
LCS Analyzed: 07/25/03 (3G25064-BS1)										
Surfactants (MBAS)	0.230	0.10	mg/l	0.250		92	90-110			
Matrix Spike Analyzed: 07/25/03 (3G25064-MS1)					**Source: CMG0155-01**					
Surfactants (MBAS)	0.195	0.40	mg/l	1.00	0.11	8	50-125			*M2*
Matrix Spike Dup Analyzed: 07/25/03 (3G25064-MSD1)					**Source: CMG0155-01**					
Surfactants (MBAS)	0.203	0.40	mg/l	1.00	0.11	9	50-125	4	20	*M2*
Batch: 3G25073 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25073-BLK1)										
Chromium VI	ND	0.0010	mg/l							
LCS Analyzed: 07/25/03 (3G25073-BS1)										
Chromium VI	0.0525	0.0010	mg/l	0.0500		105	90-110			
Matrix Spike Analyzed: 07/25/03 (3G25073-MS1)					**Source: CMG0155-01**					
Chromium VI	0.0532	0.0010	mg/l	0.0500	ND	106	70-130			
Matrix Spike Dup Analyzed: 07/25/03 (3G25073-MSD1)					**Source: CMG0155-01**					
Chromium VI	0.0534	0.0010	mg/l	0.0500	ND	107	70-130	0	15	
Batch: 3G25077 Extracted: 07/25/03										
Duplicate Analyzed: 07/25/03 (3G25077-DUP1)					**Source: IMG1309-04**					
pH	7.75	NA	pH Units		7.76			0	5	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G25079 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25079-BLK1)										
Odor	ND	1.0	T.O.N.							
Batch: 3G26035 Extracted: 07/26/03										
Duplicate Analyzed: 07/26/03 (3G26035-DUP1)					**Source: CMG0155-01**					
Color	19.0	1.0	Color Units		19			0	20	
Batch: 3G26036 Extracted: 07/26/03										
Blank Analyzed: 07/26/03 (3G26036-BLK1)										
Turbidity	ND	1.0	NTU							
Duplicate Analyzed: 07/26/03 (3G26036-DUP1)					**Source: CMG0155-01**					
Turbidity	1000	50	NTU		990			1	20	
Batch: 3G28039 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28039-BLK1)										
Fluoride	ND	0.50	mg/l							
LCS Analyzed: 07/28/03 (3G28039-BS1)										
Fluoride	4.70	0.50	mg/l	5.00		94	90-110			
Matrix Spike Analyzed: 07/28/03 (3G28039-MS1)					**Source: IMG1251-01**					
Fluoride	5.25	2.5	mg/l	5.00	1.4	77	80-120			*M2*

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28039 Extracted: 07/28/03										
Matrix Spike Dup Analyzed: 07/28/03 (3G28039-MSD1)					**Source: IMG1251-01**					
Fluoride	4.60	2.5	mg/l	5.00	1.4	64	80-120	13	20	*M2*
Batch: 3G28048 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28048-BLK1)										
Ammonia-N	ND	0.50	mg/l							
LCS Analyzed: 07/28/03 (3G28048-BS1)										
Ammonia-N	1.06	0.50	mg/l	1.00		106	85-115			
Matrix Spike Analyzed: 07/28/03 (3G28048-MS1)					**Source: IMG1139-01**					
Ammonia-N	2.00	0.50	mg/l	2.00	0.11	94	75-125			
Matrix Spike Dup Analyzed: 07/28/03 (3G28048-MSD1)					**Source: IMG1139-01**					
Ammonia-N	2.08	0.50	mg/l	2.00	0.11	98	75-125	4	15	
Batch: 3G28059 Extracted: 07/28/03										
Blank Analyzed: 07/29/03 (3G28059-BLK1)										
Hardness (as CaCO3)	ND	1.0	mg/l							
Batch: 3G28060 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28060-BLK1)										
Total Suspended Solids	ND	10	mg/l							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28060 Extracted: 07/28/03										
LCS Analyzed: 07/28/03 (3G28060-BS1)										
Total Suspended Solids	1000	10	mg/l	1000		100	85-115			
Duplicate Analyzed: 07/28/03 (3G28060-DUP1)					**Source: IMG1245-01**					
Total Suspended Solids	1340	10	mg/l		1300			3	5	
Batch: 3G28061 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28061-BLK1)										
Total Cyanide	ND	0.025	mg/l							
LCS Analyzed: 07/28/03 (3G28061-BS1)										
Total Cyanide	0.204	0.025	mg/l	0.200		102	90-110			
Matrix Spike Analyzed: 07/28/03 (3G28061-MS1)					**Source: IMG1253-01**					
Total Cyanide	0.194	0.025	mg/l	0.200	ND	97	70-115			
Matrix Spike Dup Analyzed: 07/28/03 (3G28061-MSD1)					**Source: IMG1253-01**					
Total Cyanide	0.192	0.025	mg/l	0.200	ND	96	70-115	1	15	
Batch: 3G28079 Extracted: 07/28/03										
Duplicate Analyzed: 07/28/03 (3G28079-DUP1)					**Source: IMG1345-01**					
Specific Conductance	880	1.0	umhos/cm		890			1	5	
Batch: 3G28080 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28080-BLK1)										
Total Dissolved Solids	ND	10	mg/l							

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Batch: 3G28080 Extracted: 07/28/03										
Duplicate Analyzed: 07/28/03 (3G28080-DUP1)					**Source: IMG1248-01**					
Total Dissolved Solids	4400	10	mg/l		4400			0	20	
Reference Analyzed: 07/28/03 (3G28080-SRM1)										
Total Dissolved Solids	1020	10	mg/l	1000		102	90-110			
Batch: 3G30049 Extracted: 07/30/03										
Blank Analyzed: 07/30/03 (3G30049-BLK1)										
Phosphorus	ND	0.050	mg/l							
LCS Analyzed: 07/30/03 (3G30049-BS1)										
Phosphorus	0.991	0.050	mg/l	1.00		99	80-120			
Matrix Spike Analyzed: 07/30/03 (3G30049-MS1)					**Source: IMG1448-02**					
Phosphorus	1.07	0.050	mg/l	1.00	0.11	96	65-130			
Matrix Spike Dup Analyzed: 07/30/03 (3G30049-MSD1)					**Source: IMG1448-02**					
Phosphorus	1.11	0.050	mg/l	1.00	0.11	100	65-130	4	15	
Batch: 3G30056 Extracted: 07/30/03										
Blank Analyzed: 07/30/03 (3G30056-BLK1)										
Total Organic Carbon	ND	1.0	mg/l							
LCS Analyzed: 07/30/03 (3G30056-BS1)										
Total Organic Carbon	10.3	1.0	mg/l	10.0		103	90-110			

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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: Antelope Valley Report Number: CMG0155	 Sampled: 07/25/03 Received: 07/25/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G30056 Extracted: 07/30/03										
Matrix Spike Analyzed: 07/30/03 (3G30056-MS1)					**Source: IMG1194-02**					
Total Organic Carbon	11.0	1.0	mg/l	5.00	5.8	104	80-120			
Matrix Spike Dup Analyzed: 07/30/03 (3G30056-MSD1)					**Source: IMG1194-02**					
Total Organic Carbon	10.8	1.0	mg/l	5.00	5.8	100	80-120	2	20	
Batch: 3G31105 Extracted: 07/31/03										
Duplicate Analyzed: 07/31/03 (3G31105-DUP1)					**Source: IMG1565-01**					
Alkalinity as CaCO3	176	2.0	mg/l		180			2	20	
Bicarbonate Alkalinity as CaCO3	176	2.0	mg/l		180			2	20	
Carbonate Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Hydroxide Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Reference Analyzed: 07/31/03 (3G31105-SRM1)										
Alkalinity as CaCO3	308	2.0	mg/l	311		99	94-105			

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Layne Geosciences	Project ID: Antelope Valley	
11001 Etiwanda Avenue		Sampled: 07/25/03
Fontana, CA 92337	Report Number: CMG0155	Received: 07/25/03
Attention: Tony Morgan		

DATA QUALIFIERS AND DEFINITIONS

C	Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.
H3	Sample was received and analyzed past holding time.
M1	The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
M2	The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
M3	Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).
M-HA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
RL-1	Reporting limit raised due to sample matrix effects.
ND	Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.
RPD	Relative Percent Difference
T.O.N.	Threshhold Odor Number
SI Units	Saturation Index Units

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

Certification Summary

Subcontracted Laboratories

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: EPA 120.1
Samples: CMG0155-01
Method Performed: EPA 150.1
Samples: CMG0155-01
Method Performed: EPA 160.1
Samples: CMG0155-01
Method Performed: EPA 160.2
Samples: CMG0155-01
Method Performed: EPA 170.1
Samples: CMG0155-01
Method Performed: EPA 180.1
Samples: CMG0155-01
Method Performed: EPA 200.7
Samples: CMG0155-01
Method Performed: EPA 200.7-Diss
Samples: CMG0155-01
Method Performed: EPA 200.8
Samples: CMG0155-01
Method Performed: EPA 200.8-Diss
Samples: CMG0155-01
Method Performed: EPA 218.6
Samples: CMG0155-01
Method Performed: EPA 245.1
Samples: CMG0155-01
Method Performed: EPA 245.1-Diss
Samples: CMG0155-01
Method Performed: EPA 300.0
Samples: CMG0155-01
Method Performed: EPA 350.3
Samples: CMG0155-01
Method Performed: EPA 365.3
Samples: CMG0155-01
Method Performed: EPA 415.1
Samples: CMG0155-01
Method Performed: SM 2330B
Samples: CMG0155-01
Method Performed: SM2120B
Samples: CMG0155-01
Method Performed: SM2150B
Samples: CMG0155-01

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: SM2320B
Samples: CMG0155-01

Method Performed: SM2340B
Samples: CMG0155-01

Method Performed: SM4500-CN-C,E
Samples: CMG0155-01

Method Performed: SM5540-C
Samples: CMG0155-01

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Jeanne Shoulder
Project Manager

CMG0155

Del Mar Analytical
Providing Quality Environmental Laboratory Services

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DRINKING WATER CHAIN OF CUSTODY FORM

Client Name: LAYNE
P.O./Project Name: Van Dam
Address: 11001 Etiwanda Ave
Project Manager: Lou Kohn / Tony Morgan
City: Fontana State: CA Zip: 92337
Compliance Sample: Yes ___ No X
POE #:
Tel: (909) 390-2833 Fax: (909) 390-6097
Data to state's database? Yes (PWS ID required) ___ No X
PWS ID#:
Sampler(s) Name & Signature: Lou Kohn [signature]
Samples acidified after dechlorination? Yes ___ No X

Sample I.D.	Matrix (see Matrix Table)	Date Sampled	Time	Number of Containers	Volatiles Reg.☐ UnReg.☐ 524.2	Trihalomethanes Only 524.2	Semivolatiles Reg.☐ UnReg.☐ 525.2	EDB / DBCP / TCP 504.1	Pesticides and PCBs 505 ☐ 508.1 ☐	Chlorinated Acids 515.3	Carbamates 531.1	Glyphosate 547	Endothall 548.1	Diquat / Paraquat 549.2	Coliform, Total ☐ Fecal ☐	Heterotrophic Plate Count (HPC)	Metals (Specify)	General Minerals (see fee schedule)	General Physical (see fee schedule)	Inorganic Chemicals (see fee schedule)	Diss-As T-Phosphate	Si, B, TOC, Cr6+	NH4, TSS, Br		
Van Dam #3 498'	GW	7/25	1325	9														X	X	X	X	X	X		

Metals:
☐ Aluminum
☐ Antimony
☐ Arsenic
☐ Barium
☐ Beryllium
☐ Boron
☐ Cadmium
☐ Calcium
☐ Chromium
☐ Copper
☐ Iron
☐ Lead
☐ Magnesium
☐ Manganese
☐ Mercury
☐ Nickel
☐ Potassium
☐ Selenium
☐ Silver
☐ Sodium
☐ Thallium
☐ Vanadium
☐ Zinc
☐ other: ______

Matrix Types
DW - Drinking Water
SW - Surface Water
RW - Raw Water (Source)
GW - Groundwater
RW - Recreational Water
TW - Treated Water (Point of Entry)

Relinquished by: Lou Kohn [signature] Date/Time: 7/25 16:00
Received by: Date/Time:
Relinquished by: Date/Time:
Received by: Date/Time:
Relinquished by: Date/Time:
Received in Lab by: Jeanne [signature] Date/Time: 7/25/03 16:00
Remarks:

Turnaround Time*: (check one)
Normal X 7 day ___
72 Hours ___ 48 hours ___
24 Hours ___ Immediate ___
*Surcharges may be applied for remaining hold time <48 hours.
Sample Integrity: Temp: 0°C
Intact: ___ On Ice: X

Form Rev. 3-27-03

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LABORATORY REPORT

Prepared For: Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project: WDS Van Dam

Sampled: 08/01/03
Received: 08/01/03
Issued: 08/18/03

CA ELAP #1169

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical. This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

SUBCONTRACTED: Refer to the last page for specific subcontract laboratory information included in this report.

LABORATORY ID	CLIENT ID	MATRIX
CMH0004-01	Van Dam #4 358'	Water

Del Mar Analytical, Colton
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Project Manager

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: ug/l								
Aluminum	EPA 200.7	3H06080	50	**39000**	1	8/6/2003	8/7/2003	
Antimony	EPA 200.8	3H11042	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8	3H11042	1.0	**8.5**	1	8/11/2003	8/11/2003	
Barium	EPA 200.7	3H06080	10	**250**	1	8/6/2003	8/7/2003	
Beryllium	EPA 200.8	3H11042	0.50	**0.92**	1	8/11/2003	8/11/2003	
Boron	EPA 200.7	3H06080	50	ND	1	8/6/2003	8/7/2003	
Cadmium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7	3H06080	100	**35000**	1	8/6/2003	8/7/2003	
Chromium	EPA 200.7	3H06080	5.0	**82**	1	8/6/2003	8/7/2003	
Copper	EPA 200.7	3H06080	10	**56**	1	8/6/2003	8/7/2003	
Iron	EPA 200.7	3H06080	40	**56000**	1	8/6/2003	8/7/2003	
Lead	EPA 200.7	3H06080	5.0	**13**	1	8/6/2003	8/7/2003	
Magnesium	EPA 200.7	3H06080	20	**22000**	1	8/6/2003	8/7/2003	
Manganese	EPA 200.7	3H06080	20	**1100**	1	8/6/2003	8/7/2003	
Mercury	EPA 245.1	3H04054	0.20	**1.9**	1	8/4/2003	8/4/2003	
Nickel	EPA 200.7	3H06080	10	**65**	1	8/6/2003	8/7/2003	
Potassium	EPA 200.7	3H06080	500	**6600**	1	8/6/2003	8/7/2003	
Selenium	EPA 200.7	3H06080	5.0	ND	1	8/6/2003	8/7/2003	
Silicon	EPA 200.7	3H06080	51	**50000**	1	8/6/2003	8/8/2003	
Silver	EPA 200.7	3H06080	10	ND	1	8/6/2003	8/7/2003	
Sodium	EPA 200.7	3H06080	500	**36000**	1	8/6/2003	8/7/2003	
Thallium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7	3H06080	20	**120**	1	8/6/2003	8/7/2003	

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Jeanne Shoulder
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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

DISSOLVED METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: ug/l								
Aluminum	EPA 200.7-Diss	3H14051	50	ND	1	8/14/2003	8/15/2003	
Antimony	EPA 200.8-Diss	3H11039	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8-Diss	3H11039	1.0	**1.4**	1	8/11/2003	8/11/2003	
Barium	EPA 200.7-Diss	3H14051	10	**30**	1	8/14/2003	8/15/2003	
Beryllium	EPA 200.8-Diss	3H11039	0.50	ND	1	8/11/2003	8/11/2003	C
Boron	EPA 200.7-Diss	3H14051	50	ND	1	8/14/2003	8/15/2003	
Cadmium	EPA 200.8-Diss	3H11039	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7-Diss	3H14051	100	**18000**	1	8/14/2003	8/15/2003	
Chromium	EPA 200.7-Diss	3H14051	5.0	ND	1	8/14/2003	8/15/2003	
Copper	EPA 200.7-Diss	3H14051	10	ND	1	8/14/2003	8/15/2003	
Iron	EPA 200.7-Diss	3H14051	40	ND	1	8/14/2003	8/15/2003	
Lead	EPA 200.7-Diss	3H14051	5.0	ND	1	8/14/2003	8/15/2003	
Magnesium	EPA 200.7-Diss	3H14051	20	**2100**	1	8/14/2003	8/15/2003	
Manganese	EPA 200.7-Diss	3H14051	20	**25**	1	8/14/2003	8/15/2003	
Mercury	EPA 245.1-Diss	3H13076	0.20	ND	1	8/13/2003	8/13/2003	
Nickel	EPA 200.7-Diss	3H14051	10	ND	1	8/14/2003	8/15/2003	
Potassium	EPA 200.7-Diss	3H14051	500	**2300**	1	8/14/2003	8/15/2003	
Selenium	EPA 200.7-Diss	3H14051	5.0	ND	1	8/14/2003	8/15/2003	
Silicon	EPA 200.7-Diss	3H14051	51	**5000**	1	8/14/2003	8/15/2003	
Silver	EPA 200.7-Diss	3H14051	10	ND	1	8/14/2003	8/15/2003	
Sodium	EPA 200.7-Diss	3H14051	500	**33000**	1	8/14/2003	8/15/2003	
Thallium	EPA 200.8-Diss	3H11039	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7-Diss	3H14051	20	**24**	1	8/14/2003	8/15/2003	

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: °C								
Temperature	EPA 170.1	3H06051	NA	**23**	1	8/1/2003	8/1/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: Color Units								
Color	SM2120B	3H02041	1.0	**19**	1	8/2/2003	8/2/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: mg/l								
Alkalinity as CaCO3	SM2320B	3H08061	2.0	**130**	1	8/8/2003	8/8/2003	
Bicarbonate Alkalinity as CaCO3	SM2320B	3H08061	2.0	**130**	1	8/8/2003	8/8/2003	
Carbonate Alkalinity as CaCO3	SM2320B	3H08061	2.0	ND	1	8/8/2003	8/8/2003	
Hydroxide Alkalinity as CaCO3	SM2320B	3H08061	2.0	ND	1	8/8/2003	8/8/2003	
Ammonia-N	EPA 350.3	3H04032	0.50	ND	1	8/4/2003	8/4/2003	
Bromide	EPA 300.0	3H01037	0.50	ND	1	8/1/2003	8/1/2003	
Chloride	EPA 300.0	3H01037	0.50	**11**	1	8/1/2003	8/1/2003	
Chromium VI	EPA 7196A	3H01087	0.010	ND	1	8/1/2003	8/1/2003	
Total Cyanide	SM4500-CN-C,E	3H05061	0.025	ND	1	8/5/2003	8/5/2003	
Fluoride	EPA 300.0	3H01037	0.50	ND	1	8/1/2003	8/1/2003	
Hardness (as CaCO3)	SM2340B	3H06080	1.0	**180**	1	8/6/2003	8/7/2003	
Nitrate-NO3	EPA 300.0	3H01037	0.50	**11**	1	8/1/2003	8/1/2003	
Nitrite-N	EPA 300.0	3H01037	0.15	**0.17**	1	8/1/2003	8/1/2003	
Nitrate/Nitrite-N	EPA 300.0	3H01037	0.15	**2.7**	1	8/1/2003	8/1/2003	
Phosphorus	EPA 365.3	3H05050	0.050	**1.1**	1	8/5/2003	8/5/2003	
Sulfate	EPA 300.0	3H01037	0.50	**24**	1	8/1/2003	8/1/2003	
Surfactants (MBAS)	SM5540-C	3H01091	0.10	ND	1	8/1/2003	8/1/2003	
Total Dissolved Solids	EPA 160.1	3H06060	10	**240**	1	8/6/2003	8/6/2003	
Total Organic Carbon	EPA 415.1	3H07088	1.0	**3.9**	1	8/7/2003	8/7/2003	
Total Suspended Solids	EPA 160.2	3H05089	10	**3600**	1	8/5/2003	8/5/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: NTU								
Turbidity	EPA 180.1	3H02040	100	**2600**	100	8/2/2003	8/2/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: pH Units								
pH	EPA 150.1	3H01090	NA	**7.84**	1	8/1/2003	8/1/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: T.O.N.								
Odor	SM2150B	3H01089	1.0	ND	1	8/1/2003	8/1/2003	

Del Mar Analytical, Colton
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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: umhos/cm								
Specific Conductance	EPA 120.1	3H06062	1.0	**320**	1	8/6/2003	8/6/2003	

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Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

LANGLIER SATURATION INDEX

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: SI Units								
Langlier Index	SM 2330B	3H08066	0.010	**0.16**	1	8/8/2003	8/8/2003	

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SHORT HOLD TIME DETAIL REPORT

	Hold Time (in days)	Date/Time Sampled	Date/Time Received	Date/Time Extracted	Date/Time Analyzed
Sample ID: Van Dam #4 358' (CMH0004-01) - Water					
EPA 150.1	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 19:30	08/01/2003 20:45
EPA 170.1	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 07:30	08/01/2003 07:30
EPA 180.1	2	08/01/2003 07:30	08/01/2003 13:35	08/02/2003 14:00	08/02/2003 15:00
EPA 300.0	2	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 19:15	08/01/2003 19:29
EPA 7196A	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 20:00	08/01/2003 20:02
SM2120B	2	08/01/2003 07:30	08/01/2003 13:35	08/02/2003 13:00	08/02/2003 14:00
SM2150B	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 20:30	08/01/2003 21:15
SM5540-C	2	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 20:43	08/01/2003 21:00

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H04054 Extracted: 08/04/03										
Blank Analyzed: 08/04/03 (3H04054-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 08/04/03 (3H04054-BS1)										
Mercury	7.82	0.20	ug/l	8.00		98	85-115			
Matrix Spike Analyzed: 08/04/03 (3H04054-MS1)					**Source: IMH0056-01**					
Mercury	7.69	0.20	ug/l	8.00	ND	96	70-130			
Matrix Spike Dup Analyzed: 08/04/03 (3H04054-MSD1)					**Source: IMH0056-01**					
Mercury	7.56	0.20	ug/l	8.00	ND	94	70-130	2	20	
Batch: 3H06080 Extracted: 08/06/03										
Blank Analyzed: 08/07/03 (3H06080-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H06080 Extracted: 08/06/03										
LCS Analyzed: 08/07/03 (3H06080-BS1)										
Aluminum	458	50	ug/l	500		92	85-115			
Barium	517	10	ug/l	500		103	85-115			
Boron	515	50	ug/l	500		103	85-115			
Calcium	2580	100	ug/l	2500		103	85-115			
Chromium	510	5.0	ug/l	500		102	85-115			
Copper	491	10	ug/l	500		98	85-115			
Iron	521	40	ug/l	500		104	85-115			
Lead	519	5.0	ug/l	500		104	85-115			
Magnesium	2620	20	ug/l	2500		105	85-115			
Manganese	510	20	ug/l	500		102	85-115			
Nickel	496	10	ug/l	500		99	85-115			
Potassium	4790	500	ug/l	5000		96	85-115			
Selenium	503	5.0	ug/l	500		101	85-115			
Silicon	2340	51	ug/l	2500		94	85-115			
Silver	254	10	ug/l	250		102	85-115			
Sodium	2570	500	ug/l	2500		103	85-115			
Zinc	503	20	ug/l	500		101	85-115			
Matrix Spike Analyzed: 08/07/03 (3H06080-MS1)					**Source: IMH0140-01**					
Aluminum	4220	50	ug/l	500	2600	324	70-130			*M-HA*
Barium	571	10	ug/l	500	62	102	70-130			
Boron	1550	50	ug/l	500	990	112	70-130			
Calcium	222000	100	ug/l	2500	220000	80	70-130			*M-HA*
Chromium	511	5.0	ug/l	500	4.2	101	70-130			
Copper	517	10	ug/l	500	11	101	70-130			
Iron	4410	40	ug/l	500	3500	182	70-130			*M-HA*
Lead	501	5.0	ug/l	500	3.8	99	70-130			
Magnesium	59600	20	ug/l	2500	56000	144	70-130			*M-HA*
Manganese	654	20	ug/l	500	150	101	70-130			
Nickel	466	10	ug/l	500	6.2	92	70-130			
Potassium	9830	500	ug/l	5000	4800	101	70-130			
Selenium	530	5.0	ug/l	500	16	103	70-130			
Silicon	25000	51	ug/l	2500	21000	160	70-130			*M-HA*
Silver	258	10	ug/l	250	ND	103	70-130			
Sodium	96700	500	ug/l	2500	92000	188	70-130			*M-HA*

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H06080 Extracted: 08/06/03										
Matrix Spike Analyzed: 08/07/03 (3H06080-MS1)					**Source: IMH0140-01**					
Zinc	558	20	ug/l	500	52	101	70-130			
Matrix Spike Dup Analyzed: 08/07/03 (3H06080-MSD1)					**Source: IMH0140-01**					
Aluminum	4250	50	ug/l	500	2600	330	70-130	1	20	*M-HA*
Barium	572	10	ug/l	500	62	102	70-130	0	20	
Boron	1550	50	ug/l	500	990	112	70-130	0	20	
Calcium	221000	100	ug/l	2500	220000	40	70-130	1	20	*M-HA*
Chromium	515	5.0	ug/l	500	4.2	102	70-130	1	20	
Copper	517	10	ug/l	500	11	101	70-130	0	20	
Iron	4460	40	ug/l	500	3500	192	70-130	1	20	*M-HA*
Lead	505	5.0	ug/l	500	3.8	100	70-130	1	20	
Magnesium	59500	20	ug/l	2500	56000	140	70-130	0	20	*M-HA*
Manganese	654	20	ug/l	500	150	101	70-130	0	20	
Nickel	469	10	ug/l	500	6.2	93	70-130	1	20	
Potassium	9690	500	ug/l	5000	4800	98	70-130	1	20	
Selenium	540	5.0	ug/l	500	16	105	70-130	2	20	
Silicon	25000	51	ug/l	2500	21000	160	70-130	0	20	*M-HA*
Silver	258	10	ug/l	250	ND	103	70-130	0	20	
Sodium	95000	500	ug/l	2500	92000	120	70-130	2	20	*M-HA*
Zinc	558	20	ug/l	500	52	101	70-130	0	20	
Batch: 3H11042 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11042-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11042 Extracted: 08/11/03										
LCS Analyzed: 08/11/03 (3H11042-BS1)										
Antimony	90.5	2.0	ug/l	80.0		113	85-115			
Arsenic	88.5	1.0	ug/l	80.0		111	85-115			
Beryllium	83.0	0.50	ug/l	80.0		104	85-115			
Cadmium	85.1	1.0	ug/l	80.0		106	85-115			
Thallium	84.2	1.0	ug/l	80.0		105	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11042-MS1)					**Source: IMH0411-01**					
Antimony	82.3	2.0	ug/l	80.0	0.49	102	70-130			
Arsenic	119	1.0	ug/l	80.0	34	106	70-130			
Beryllium	74.8	0.50	ug/l	80.0	ND	94	70-130			
Cadmium	71.5	1.0	ug/l	80.0	0.092	89	70-130			
Thallium	79.0	1.0	ug/l	80.0	ND	99	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11042-MSD1)					**Source: IMH0411-01**					
Antimony	82.2	2.0	ug/l	80.0	0.49	102	70-130	0	20	
Arsenic	119	1.0	ug/l	80.0	34	106	70-130	0	20	
Beryllium	76.2	0.50	ug/l	80.0	ND	95	70-130	2	20	
Cadmium	71.4	1.0	ug/l	80.0	0.092	89	70-130	0	20	
Thallium	79.2	1.0	ug/l	80.0	ND	99	70-130	0	20	

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DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11039 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11039-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							
LCS Analyzed: 08/11/03 (3H11039-BS1)										
Antimony	86.1	2.0	ug/l	80.0		108	85-115			
Arsenic	87.1	1.0	ug/l	80.0		109	85-115			
Beryllium	90.8	0.50	ug/l	80.0		114	85-115			
Cadmium	82.7	1.0	ug/l	80.0		103	85-115			
Thallium	82.0	1.0	ug/l	80.0		102	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11039-MS1)					**Source: CMH0004-01**					
Antimony	87.3	2.0	ug/l	80.0	0.78	108	70-130			
Arsenic	89.5	1.0	ug/l	80.0	1.4	110	70-130			
Beryllium	90.3	0.50	ug/l	80.0	ND	113	70-130			
Cadmium	82.2	1.0	ug/l	80.0	0.047	103	70-130			
Thallium	82.2	1.0	ug/l	80.0	ND	103	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11039-MSD1)					**Source: CMH0004-01**					
Antimony	87.9	2.0	ug/l	80.0	0.78	109	70-130	1	20	
Arsenic	89.8	1.0	ug/l	80.0	1.4	110	70-130	0	20	
Beryllium	92.5	0.50	ug/l	80.0	ND	116	70-130	2	20	
Cadmium	82.5	1.0	ug/l	80.0	0.047	103	70-130	0	20	
Thallium	82.9	1.0	ug/l	80.0	ND	104	70-130	1	20	

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METHOD BLANK/QC DATA

DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H13076 Extracted: 08/13/03										
Blank Analyzed: 08/13/03 (3H13076-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 08/13/03 (3H13076-BS1)										
Mercury	8.25	0.20	ug/l	8.00		103	85-115			
Matrix Spike Analyzed: 08/13/03 (3H13076-MS1)					**Source: CMH0004-01**					
Mercury	7.75	0.20	ug/l	8.00	ND	97	70-130			
Matrix Spike Dup Analyzed: 08/13/03 (3H13076-MSD1)					**Source: CMH0004-01**					
Mercury	7.80	0.20	ug/l	8.00	ND	98	70-130	1	20	
Batch: 3H14051 Extracted: 08/14/03										
Blank Analyzed: 08/15/03 (3H14051-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							

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DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14051 Extracted: 08/14/03										
LCS Analyzed: 08/15/03 (3H14051-BS1)										**M-NR1**
Aluminum	498	50	ug/l	500		100	85-115			
Barium	539	10	ug/l	500		108	85-115			
Boron	492	50	ug/l	500		98	85-115			
Calcium	2570	100	ug/l	2500		103	85-115			
Chromium	510	5.0	ug/l	500		102	85-115			
Copper	515	10	ug/l	500		103	85-115			
Iron	518	40	ug/l	500		104	85-115			
Lead	506	5.0	ug/l	500		101	85-115			
Magnesium	2560	20	ug/l	2500		102	85-115			
Manganese	524	20	ug/l	500		105	85-115			
Nickel	517	10	ug/l	500		103	85-115			
Potassium	5200	500	ug/l	5000		104	85-115			
Selenium	511	5.0	ug/l	500		102	85-115			
Silicon	2700	51	ug/l	2500		108	85-115			
Silver	255	10	ug/l	250		102	85-115			
Sodium	2600	500	ug/l	2500		104	85-115			
Zinc	500	20	ug/l	500		100	85-115			
LCS Dup Analyzed: 08/15/03 (3H14051-BSD1)										
Aluminum	486	50	ug/l	500		97	85-115	2	20	
Barium	525	10	ug/l	500		105	85-115	3	20	
Boron	480	50	ug/l	500		96	85-115	2	20	
Calcium	2570	100	ug/l	2500		103	85-115	0	20	
Chromium	504	5.0	ug/l	500		101	85-115	1	20	
Copper	508	10	ug/l	500		102	85-115	1	20	
Iron	512	40	ug/l	500		102	85-115	1	20	
Lead	504	5.0	ug/l	500		101	85-115	0	20	
Magnesium	2530	20	ug/l	2500		101	85-115	1	20	
Manganese	525	20	ug/l	500		105	85-115	0	20	
Nickel	511	10	ug/l	500		102	85-115	1	20	
Potassium	5140	500	ug/l	5000		103	85-115	1	20	
Selenium	511	5.0	ug/l	500		102	85-115	0	20	
Silicon	2630	51	ug/l	2500		105	85-115	3	20	
Silver	248	10	ug/l	250		99	85-115	3	20	
Sodium	2590	500	ug/l	2500		104	85-115	0	20	

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METHOD BLANK/QC DATA

DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14051 Extracted: 08/14/03										
LCS Dup Analyzed: 08/15/03 (3H14051-BSD1)										
Zinc	495	20	ug/l	500		99	85-115	1	20	

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Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H01037 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01037-BLK1)										
Bromide	ND	0.50	mg/l							
Chloride	ND	0.50	mg/l							
Fluoride	ND	0.50	mg/l							
Nitrate-NO3	ND	0.50	mg/l							
Nitrite-N	ND	0.15	mg/l							
Nitrate/Nitrite-N	ND	0.15	mg/l							
Sulfate	ND	0.50	mg/l							
LCS Analyzed: 08/01/03 (3H01037-BS1)										
Bromide	4.74	0.50	mg/l	5.00		95	90-110			
Chloride	4.64	0.50	mg/l	5.00		93	90-110			*M3*
Fluoride	4.78	0.50	mg/l	5.00		96	90-110			
Nitrate-NO3	4.91	0.50	mg/l	5.00		98	90-110			
Nitrite-N	1.43	0.15	mg/l	1.52		94	90-110			
Sulfate	9.70	0.50	mg/l	10.0		97	90-110			*M3*
Matrix Spike Analyzed: 08/01/03 (3H01037-MS1)					**Source: IMH0049-02**					
Bromide	6.07	2.5	mg/l	5.00	2.0	81	80-120			
Fluoride	6.00	2.5	mg/l	5.00	1.2	96	80-120			
Nitrate-NO3	5.99	2.5	mg/l	5.00	ND	120	80-120			
Nitrite-N	4.23	0.75	mg/l	1.52	ND	278	80-120			*M1*
Matrix Spike Dup Analyzed: 08/01/03 (3H01037-MSD1)					**Source: IMH0049-02**					
Bromide	6.62	2.5	mg/l	5.00	2.0	92	80-120	9	20	
Fluoride	6.15	2.5	mg/l	5.00	1.2	99	80-120	2	20	
Nitrate-NO3	5.52	2.5	mg/l	5.00	ND	110	80-120	8	20	
Nitrite-N	5.02	0.75	mg/l	1.52	ND	330	80-120	17	20	*M1*

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H01087 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01087-BLK1)										
Chromium VI	ND	0.010	mg/l							
LCS Analyzed: 08/01/03 (3H01087-BS1)										
Chromium VI	0.0975	0.010	mg/l	0.100		97	90-110			
Matrix Spike Analyzed: 08/01/03 (3H01087-MS1)					**Source: CMH0004-01**					
Chromium VI	0.311	0.010	mg/l	0.300	ND	104	85-115			
Matrix Spike Dup Analyzed: 08/01/03 (3H01087-MSD1)					**Source: CMH0004-01**					
Chromium VI	0.301	0.010	mg/l	0.300	ND	100	85-115	3	20	
Batch: 3H01089 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01089-BLK1)										
Odor	ND	1.0	T.O.N.							
Batch: 3H01090 Extracted: 08/01/03										
Duplicate Analyzed: 08/01/03 (3H01090-DUP1)					**Source: IMH0056-01**					
pH	8.87	NA	pH Units		8.85			0	5	
Batch: 3H01091 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01091-BLK1)										
Surfactants (MBAS)	ND	0.10	mg/l							

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Sampled: 08/01/03
Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H01091 Extracted: 08/01/03										
LCS Analyzed: 08/01/03 (3H01091-BS1)										
Surfactants (MBAS)	0.230	0.10	mg/l	0.250		92	90-110			
Matrix Spike Analyzed: 08/01/03 (3H01091-MS1)					**Source: CMH0004-01**					
Surfactants (MBAS)	0.235	0.10	mg/l	0.250	ND	94	50-125			
Matrix Spike Dup Analyzed: 08/01/03 (3H01091-MSD1)					**Source: CMH0004-01**					
Surfactants (MBAS)	0.237	0.10	mg/l	0.250	ND	95	50-125	1	20	
Batch: 3H02040 Extracted: 08/02/03										
Blank Analyzed: 08/02/03 (3H02040-BLK1)										
Turbidity	ND	1.0	NTU							
Duplicate Analyzed: 08/02/03 (3H02040-DUP1)					**Source: IMH0089-01**					
Turbidity	2.13	1.0	NTU		2.1			1	20	
Batch: 3H02041 Extracted: 08/02/03										
Duplicate Analyzed: 08/02/03 (3H02041-DUP1)					**Source: CMH0004-01**					
Color	19.0	1.0	Color Units		19			0	20	
Batch: 3H04032 Extracted: 08/04/03										
Blank Analyzed: 08/04/03 (3H04032-BLK1)										
Ammonia-N	ND	0.50	mg/l							

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H04032 Extracted: 08/04/03										
LCS Analyzed: 08/04/03 (3H04032-BS1)										
Ammonia-N	1.14	0.50	mg/l	1.00		114	85-115			
Matrix Spike Analyzed: 08/04/03 (3H04032-MS1)					**Source: IMH0056-01**					
Ammonia-N	2.08	0.50	mg/l	2.00	ND	104	75-125			
Matrix Spike Dup Analyzed: 08/04/03 (3H04032-MSD1)					**Source: IMH0056-01**					
Ammonia-N	2.03	0.50	mg/l	2.00	ND	102	75-125	2	15	
Batch: 3H05050 Extracted: 08/05/03										
Blank Analyzed: 08/05/03 (3H05050-BLK1)										
Phosphorus	ND	0.050	mg/l							
LCS Analyzed: 08/05/03 (3H05050-BS1)										
Phosphorus	0.963	0.050	mg/l	1.00		96	80-120			
Matrix Spike Analyzed: 08/05/03 (3H05050-MS1)					**Source: IMH0081-01**					
Phosphorus	1.05	0.050	mg/l	1.00	0.034	102	65-130			
Matrix Spike Dup Analyzed: 08/05/03 (3H05050-MSD1)					**Source: IMH0081-01**					
Phosphorus	1.04	0.050	mg/l	1.00	0.034	101	65-130	1	15	
Batch: 3H05061 Extracted: 08/05/03										
Blank Analyzed: 08/05/03 (3H05061-BLK1)										
Total Cyanide	ND	0.025	mg/l							

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H05061 Extracted: 08/05/03										
LCS Analyzed: 08/05/03 (3H05061-BS1)										
Total Cyanide	0.189	0.025	mg/l	0.200		94	90-110			
Matrix Spike Analyzed: 08/05/03 (3H05061-MS1)					**Source: IMG1569-01**					
Total Cyanide	0.190	0.025	mg/l	0.200	ND	95	70-115			
Matrix Spike Dup Analyzed: 08/05/03 (3H05061-MSD1)					**Source: IMG1569-01**					
Total Cyanide	0.192	0.025	mg/l	0.200	ND	96	70-115	1	15	
Batch: 3H05089 Extracted: 08/05/03										
Blank Analyzed: 08/05/03 (3H05089-BLK1)										
Total Suspended Solids	ND	10	mg/l							
LCS Analyzed: 08/05/03 (3H05089-BS1)										
Total Suspended Solids	1010	10	mg/l	1000		101	85-115			
Duplicate Analyzed: 08/05/03 (3H05089-DUP1)					**Source: IMH0139-01**					
Total Suspended Solids	ND	10	mg/l		ND				5	
Batch: 3H06060 Extracted: 08/06/03										
Blank Analyzed: 08/06/03 (3H06060-BLK1)										
Total Dissolved Solids	ND	10	mg/l							
Duplicate Analyzed: 08/06/03 (3H06060-DUP1)					**Source: IMH0125-01**					
Total Dissolved Solids	371	10	mg/l		370			0	20	

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Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H06060 Extracted: 08/06/03										
Reference Analyzed: 08/06/03 (3H06060-SRM1)										
Total Dissolved Solids	986	10	mg/l	1000		99	90-110			
Batch: 3H06062 Extracted: 08/06/03										
Duplicate Analyzed: 08/06/03 (3H06062-DUP1)					**Source: IMH0125-01**					
Specific Conductance	578	1.0	umhos/cm		570			1	5	
Batch: 3H06080 Extracted: 08/06/03										
Blank Analyzed: 08/07/03 (3H06080-BLK1)										
Hardness (as CaCO3)	ND	1.0	mg/l							
Batch: 3H07088 Extracted: 08/07/03										
Blank Analyzed: 08/07/03 (3H07088-BLK1)										
Total Organic Carbon	ND	1.0	mg/l							
LCS Analyzed: 08/07/03 (3H07088-BS1)										
Total Organic Carbon	9.60	1.0	mg/l	10.0		96	90-110			
Matrix Spike Analyzed: 08/07/03 (3H07088-MS1)					**Source: IMH0056-01**					
Total Organic Carbon	7.99	1.0	mg/l	5.00	2.9	102	80-120			
Matrix Spike Dup Analyzed: 08/07/03 (3H07088-MSD1)					**Source: IMH0056-01**					
Total Organic Carbon	7.47	1.0	mg/l	5.00	2.9	91	80-120	7	20	

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H08061 Extracted: 08/08/03										
Duplicate Analyzed: 08/08/03 (3H08061-DUP1)					**Source: CMH0004-01**					
Alkalinity as CaCO3	128	2.0	mg/l		130			2	20	
Bicarbonate Alkalinity as CaCO3	128	2.0	mg/l		130			2	20	
Carbonate Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Hydroxide Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Reference Analyzed: 08/08/03 (3H08061-SRM1)										
Alkalinity as CaCO3	302	2.0	mg/l	311		97	94-105			

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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: WDS Van Dam Report Number: CMH0004	 Sampled: 08/01/03 Received: 08/01/03

DATA QUALIFIERS AND DEFINITIONS

C Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.

M1 The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

M3 Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).

M-HA Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).

M-NR1 There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike/Blank Spike Duplicate.

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

RPD Relative Percent Difference

T.O.N. Threshhold Odor Number

SI Units Saturation Index Units

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Certification Summary

Subcontracted Laboratories

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: EPA 120.1
Samples: CMH0004-01

Method Performed: EPA 150.1
Samples: CMH0004-01

Method Performed: EPA 160.1
Samples: CMH0004-01

Method Performed: EPA 160.2
Samples: CMH0004-01

Method Performed: EPA 170.1
Samples: CMH0004-01

Method Performed: EPA 180.1
Samples: CMH0004-01

Method Performed: EPA 200.7
Samples: CMH0004-01

Method Performed: EPA 200.7-Diss
Samples: CMH0004-01

Method Performed: EPA 200.8
Samples: CMH0004-01

Method Performed: EPA 200.8-Diss
Samples: CMH0004-01

Method Performed: EPA 245.1
Samples: CMH0004-01

Method Performed: EPA 245.1-Diss
Samples: CMH0004-01

Method Performed: EPA 300.0
Samples: CMH0004-01

Method Performed: EPA 350.3
Samples: CMH0004-01

Method Performed: EPA 365.3
Samples: CMH0004-01

Method Performed: EPA 415.1
Samples: CMH0004-01

Method Performed: EPA 7196A
Samples: CMH0004-01

Method Performed: SM 2330B
Samples: CMH0004-01

Method Performed: SM2120B
Samples: CMH0004-01

Method Performed: SM2150B
Samples: CMH0004-01

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Layne Geosciences	Project ID: WDS Van Dam	
11001 Etiwanda Avenue		Sampled: 08/01/03
Fontana, CA 92337	Report Number: CMH0004	Received: 08/01/03
Attention: Tony Morgan		

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: SM2320B

Samples: CMH0004-01

Method Performed: SM2340B

Samples: CMH0004-01

Method Performed: SM4500-CN-C,E

Samples: CMH0004-01

Method Performed: SM5540-C

Samples: CMH0004-01

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Del Mar Analytical
Providing Quality Environmental Laboratory Services

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DRINKING WATER CHAIN OF CUSTODY FORM

Client Name: Layne
Address: 11001 Etiwanda Ave
City: Fontana State: CA Zip: 92337
Tel: (909) 390-2833 Fax: 909 390-6097
Sampler(s) Name & Signature: Lou Kohn Lou Kohn

P.O./Project Name: WDS Van Dam
Project Manager: Lou Kohn / Tony Morgan
Compliance Sample: Yes ___ No X POE #:
Data to state's database? Yes (PWS ID required) ___ No X PWS ID#:
Samples acidified after dechlorination? Yes ___ No X

Sample I.D.	Matrix (see Matrix Table)	Date Sampled	Time	Number of Containers	Volatiles Reg. ☐ UnReg. ☐ 524.2	Trihalomethanes Only 524.2	Semivolatiles Reg. ☐ UnReg. ☐ 525.2	EDB / DBCP / TCP 504.1	Pesticides and PCBs 505 ☐ 508.1 ☐	Chlorinated Acids 515.3	Carbamates 531.1	Glyphosate 547	Endothall 548.1	Diquat / Paraquat 549.2	Coliform, Total ☐ Fecal ☐	Heterotrophic Plate Count (HPC)	Metals (Specify)	General Minerals (see fee schedule)	General Physical (see fee schedule)	Inorganic Chemicals (see fee schedule)	Diss-As T Phosphate	Si, B, TOC, Cr 6+	NH4, TSS, Br		
Van Dam #4 (358)	GW	8/1	0730	9														X	X	X	X	X	X		

Metals:
☐ Aluminum ☐ Antimony ☐ Arsenic ☐ Barium ☐ Beryllium ☐ Boron ☐ Cadmium ☐ Calcium ☐ Chromium ☐ Copper ☐ Iron ☐ Lead
☐ Magnesium ☐ Manganese ☐ Mercury ☐ Nickel ☐ Potassium ☐ Selenium ☐ Silver ☐ Sodium ☐ Thallium ☐ Vanadium ☐ Zinc ☐ other: ______

Matrix Types
DW - Drinking Water
SW - Surface Water
RW - Raw Water (Source)
GW - Groundwater
RW - Recreational Water
TW - Treated Water (Point of Entry)

Relinquished by:	Date/Time:	Received by:	Date/Time:
Lou Kohn Lou Kohn	8/1/03 1335		
		Received in Lab by: Jeanne Nevola	8/1/03 13:35

Remarks:

Turnaround Time*: (check one)
Normal X 7 day ___
72 Hours ___ 48 hours ___
24 Hours ___ Immediate ___
*Surcharges may be applied for remaining hold time <48 hours.

Sample Integrity: Temp: 7°C
Intact: ___ On Ice: X

Note: By relinquishing samples to Del Mar Analytical, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of the invoice. Sample(s) will be disposed of after 30 days. All work is subject to Del Mar Analytical's terms and conditions unless previously agreed to in writing.

Form Rev. 3-27-03

Appendix E
Hydroscience Modeling Results

Fax Memorandum

PSOMAS

To: Ralph Phraner
From: Kathy Hughes
Date: August 18, 1998
Subject: Current USGS Model for Antelope Valley
Pages: 1

To assist us in our modeling of the western Antelope Valley, I have had a few discussions with USGS personnel in Sacramento, who are at the final stages of three groundwater models of the Antelope Valley. Because of their familiarity with the area, it would be valuable to be aware of what parameters they use, and apply their expertise where appropriate.

I talked yesterday with David Leighton, who is spearheading the modeling. He knows we are doing an investigation of some sort in the western Antelope Valley. Here's what he relayed about the USGS model:

- The Antelope Valley as a whole is modeled in three layers. This is especially appropriate in eastern areas, where a thick blue clay is present. The thickness of the layers is based on information from e-logs in the Lancaster and Edwards areas. The lower layer is not present at the edges of the valley. The layers are modeled as being flat.
- The layers are defined in terms of elevation: The bottom of the top layer is from the water table to 1950 msl; the second is from 1950 ft msl to 1550 msl; and the third layer is from 1550 ft msl to 1000 ft msl.
- The hydraulic conductivity (K) is modeled as being 2 ft/day in the westernmost part of the valley. Towards the eastern end of the area we are considering, the K has pockets with values as high as 24 ft/day. The pockets were located by looking at areas of high specific capacities. The K values were calculated by back-calculating from Durbin's (1978) transmissivity values.
- Transmissivity (T) varies in layer 1 with specific capacities. T in layer 2 is modeled at 4,000 ft^2/day. T in layer 3 is modeled at 1,000 ft^2/day.
- The USGS considers 1000 ft msl as the base of the productive aquifer. They've found that the model is not sensitive to varying this. Water in the Lancaster area has been found to have high levels of arsenic.
- The USGS model is using a ratio of horizontal to vertical K of 10:1, based on experience in the Mojave Desert and other nearby areas, although a sensitivity analysis has not been performed on this ratio.

HydroScience

Summary of Simulation Results
USGS Modflow Model
Neenach Subbasin, West Antelope Valley

Simulation		Stress Period	Period Duration (days)	Cumulative Simulation Duration (days)	Cumulative Simulation Duration (years)	Stress Period Recharge (KAF)	Stress Period Pumping (KAF)	Cumulative Storage (KAF)	Maximum Head Change (ft)*
100,000 AF Scenario									
Year 1	Recharge (100 KAF)	1	180	180	0.5	100	0	100	-137
	Pumping (50 KAF)	2	180	360	1.0	0	50	50	-38
Year 2	Recharge (100 KAF)	3	180	540	1.5	100	0	150	-162
	Pumping (50 KAF)	4	180	720	2.0	0	50	100	-63
Year 3	Recharge (100 KAF)	5	180	900	2.5	100	0	200	-182
	Pumping (50 KAF)	6	180	1080	3.0	0	50	150	-83
Year 4	Recharge (100 KAF)	7	180	1260	3.5	100	0	250	-200
	Pumping (50 KAF)	8	180	1440	4.0	0	50	200	-101
Year 5	Recharge (100 KAF)	9	180	1620	4.5	100	0	300	-216
	Pumping (50 KAF)	10	180	1800	5.0	0	50	250	-118
Year 6	Pumping (50 KAF)	11	360	2160	6.0	0	50	200	-62
Year 7	Pumping (50 KAF)	12	360	2520	7.0	0	50	150	-79
Year 8	Pumping (50 KAF)	13	360	2880	8.0	0	50	100	-49

mobile1:\\d:\psomas\antelope\simulationsummary_100.xls 9/8/98 rwp

* *Computed from starting water levels; minus denotes mounding.*

Summary of Simulation Results
USGS Modflow Model
Neenach Subbasin, West Antelope Valley

Simulation		Stress Period	Period Duration (days)	Cumulative Simulation Duration (days)	Cumulative Simulation Duration (years)	Stress Period Recharge (KAF)	Stress Period Pumping (KAF)	Cumulative Storage (KAF)	Maximum Head Change (ft)*
50,000 AF Scenario									
Year 1	Recharge (100 KAF)	1	180	180	0.5	50	0	100	-70
	Pumping (50 KAF)	2	180	360	1.0	0	25	75	-19
Year 2	Recharge (100 KAF)	3	180	540	1.5	50	0	125	-82
	Pumping (50 KAF)	4	180	720	2.0	0	25	100	-32
Year 3	Recharge (100 KAF)	5	180	900	2.5	50	0	150	-93
	Pumping (50 KAF)	6	180	1080	3.0	0	25	125	-41
Year 4	Recharge (100 KAF)	7	180	1260	3.5	50	0	175	-102
	Pumping (50 KAF)	8	180	1440	4.0	0	25	150	-51
Year 5	Recharge (100 KAF)	9	180	1620	4.5	50	0	200	-110
	Pumping (50 KAF)	10	180	1800	5.0	0	25	175	-59
Year 6	Pumping (50 KAF)	11	360	2160	6.0	0	25	150	-49
Year 7	Pumping (50 KAF)	12	360	2520	7.0	0	25	125	-34
Year 8	Pumping (50 KAF)	13	360	2880	8.0	0	25	100	-28

mobile1:\\d:\psomas\antelope\simulationsummary_50.xls 9/9/98 rwp

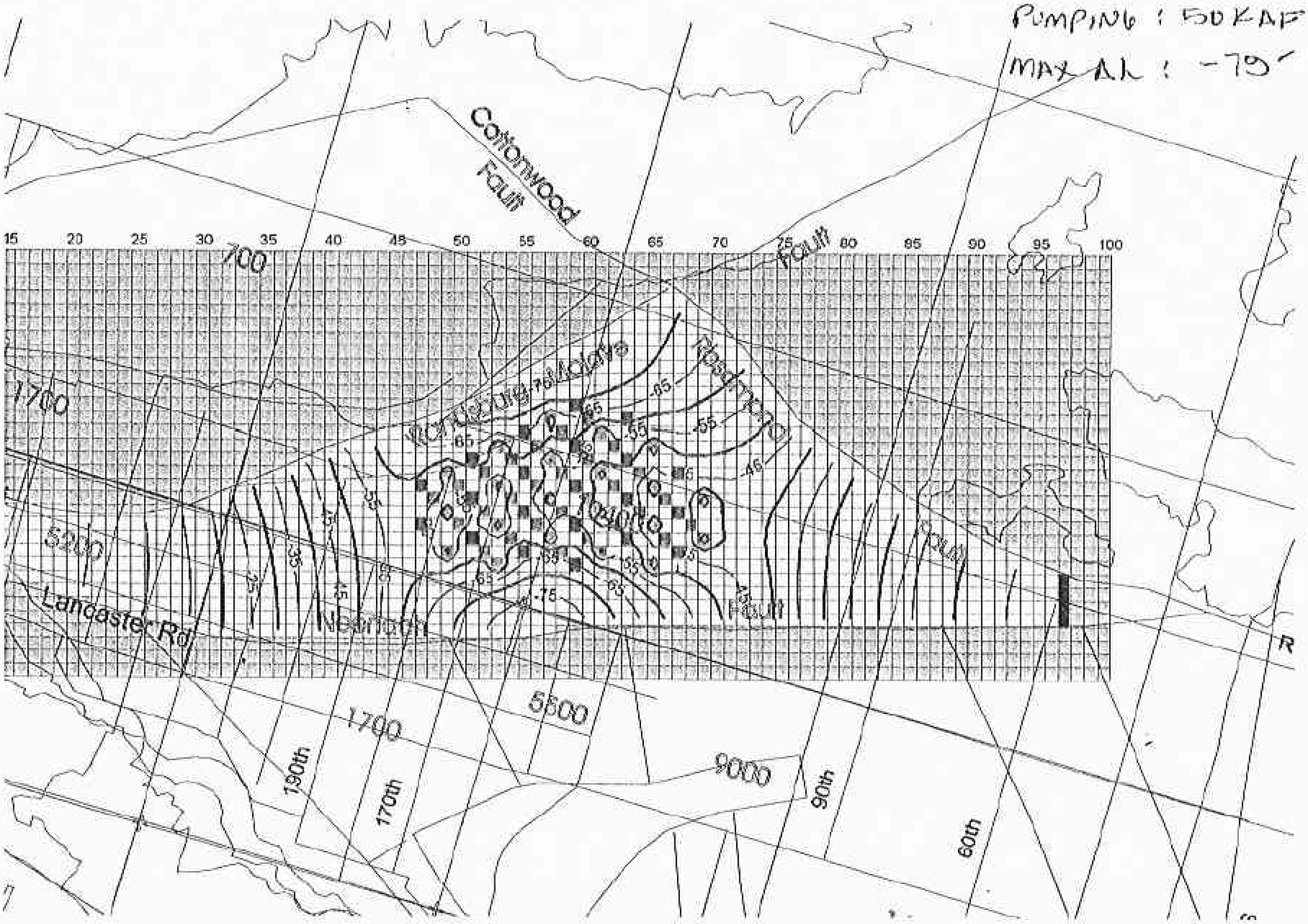
* *Computed from starting water levels; minus denotes mounding.*

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 11
PERIOD DURATION: 360d
SIMUL. DURATION: 2160d (6y)
RECHARGE: —
PUMPING: 50 KAF
MAX Δh: -79'



CONTOUR INTERVAL: 5'

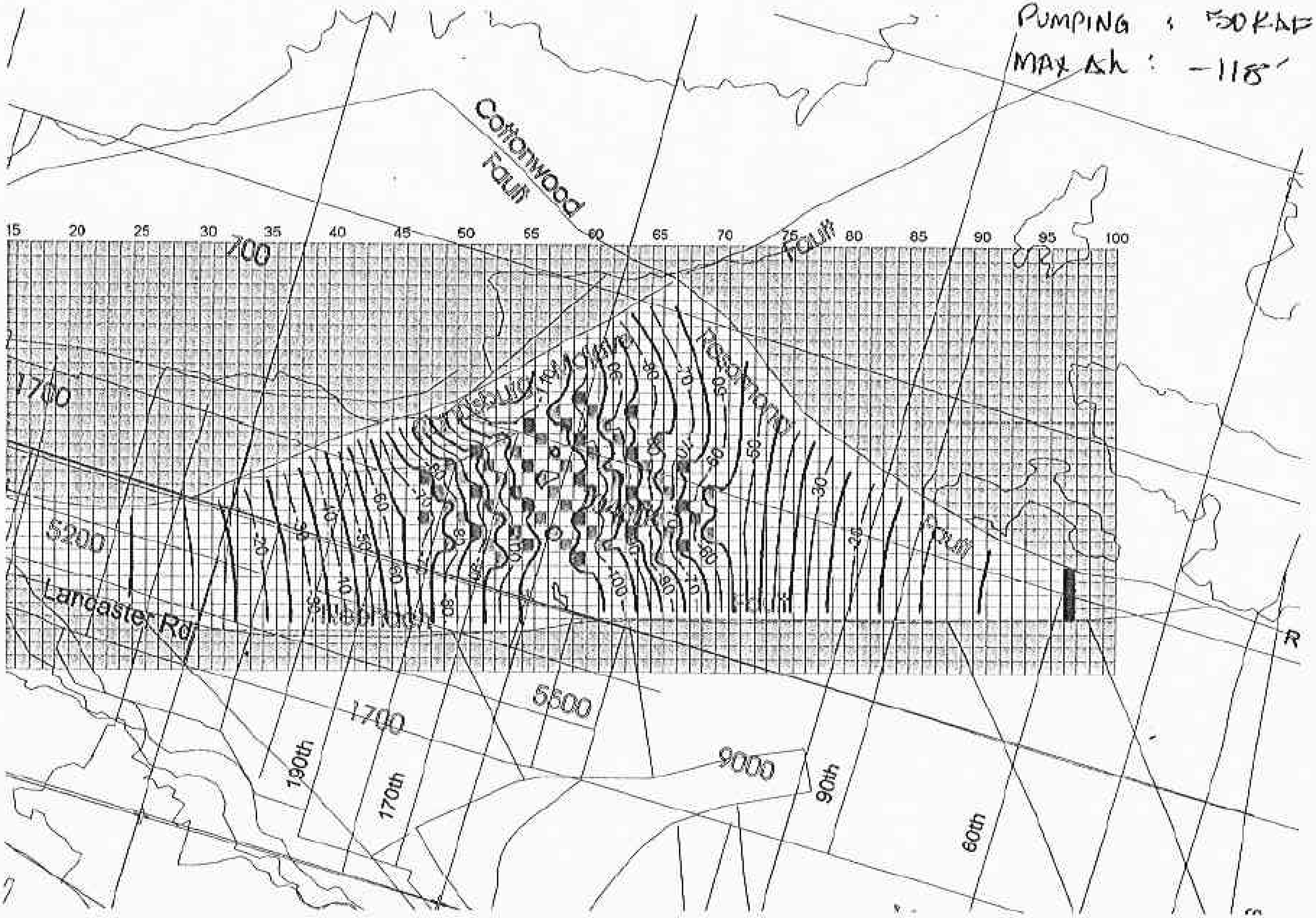
100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 10
PERIOD DURATION: 180d
SIMUL. DURATION: 1800d (5y)

RECHARGE: ———
PUMPING: 50KAF
MAX Δh: -118'



CONTOUR INTERVAL: 5'

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 9

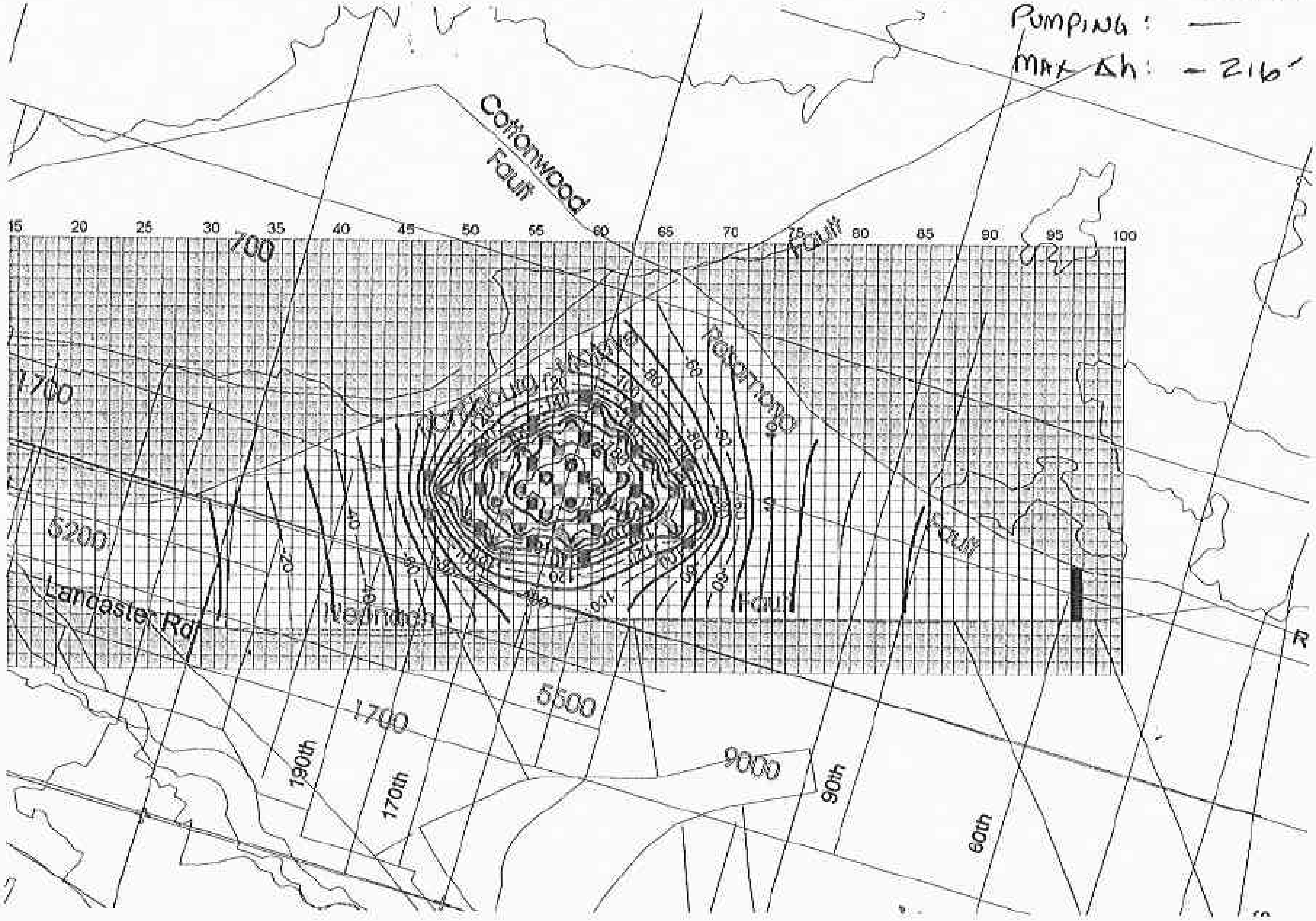
PERIOD DURATION: 180^d

SIMUL. DURATION: 1620^d (4.5Y)

RECHARGE: 100KAF

PUMPING: —

MAX Δh: -216'



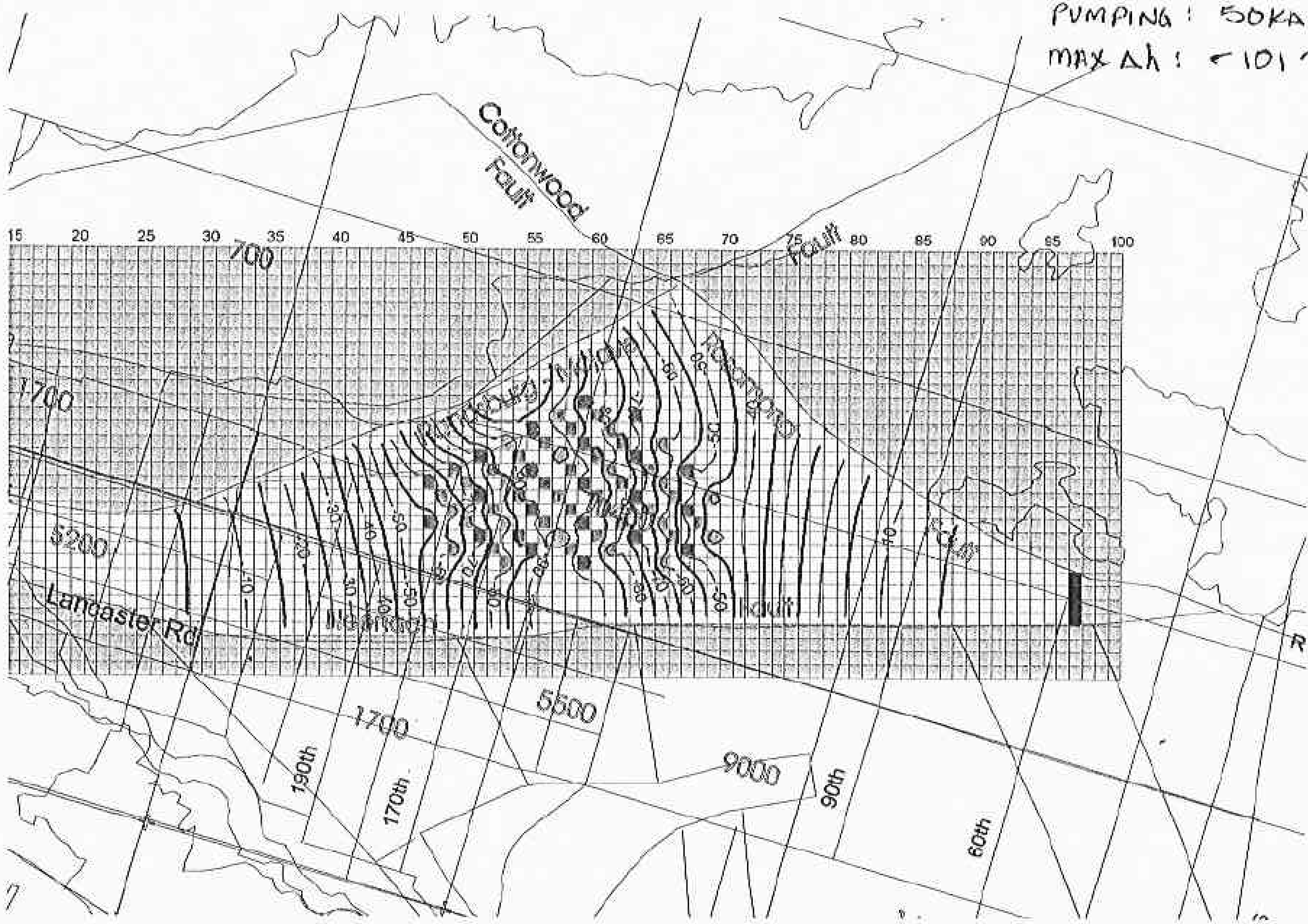
CONTOUR INTERVAL: 10'

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD : 8 :
PERIOD DURATION: 180^{d}
SIMUL. DURATION: 1440^{d} (4.Y)
RECHARGE : —
PUMPING : 50KAF
MAX Δh : ≈ 101'



CONTOUR INTERVAL : 5'

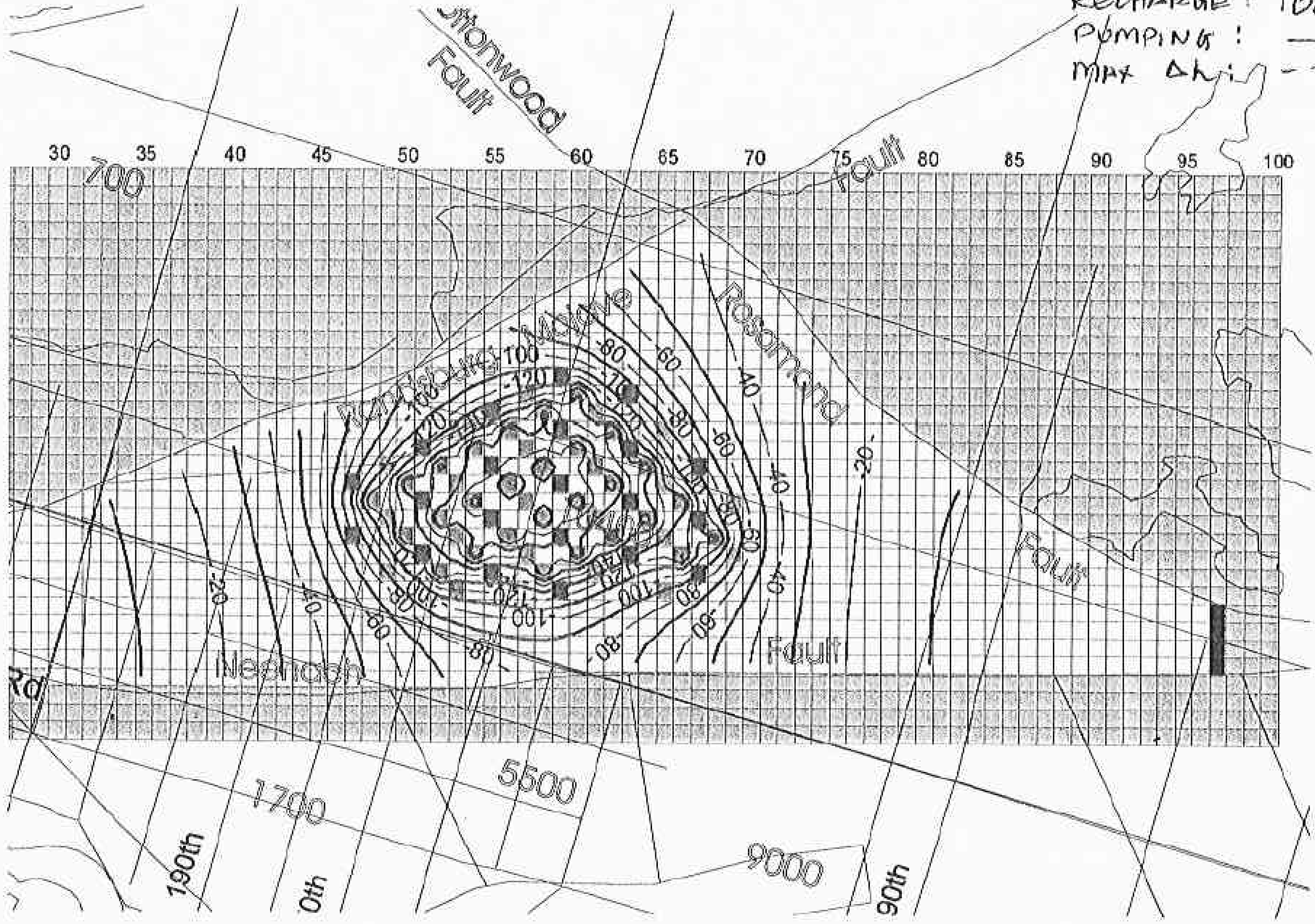
100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 7
PERIOD DURATION: 180ᵈ
SIMUL. DURATION: 1260ᵈ (3.5y)

RECHARGE: 100KAF
PUMPING: ——
MAX Δh: -200'



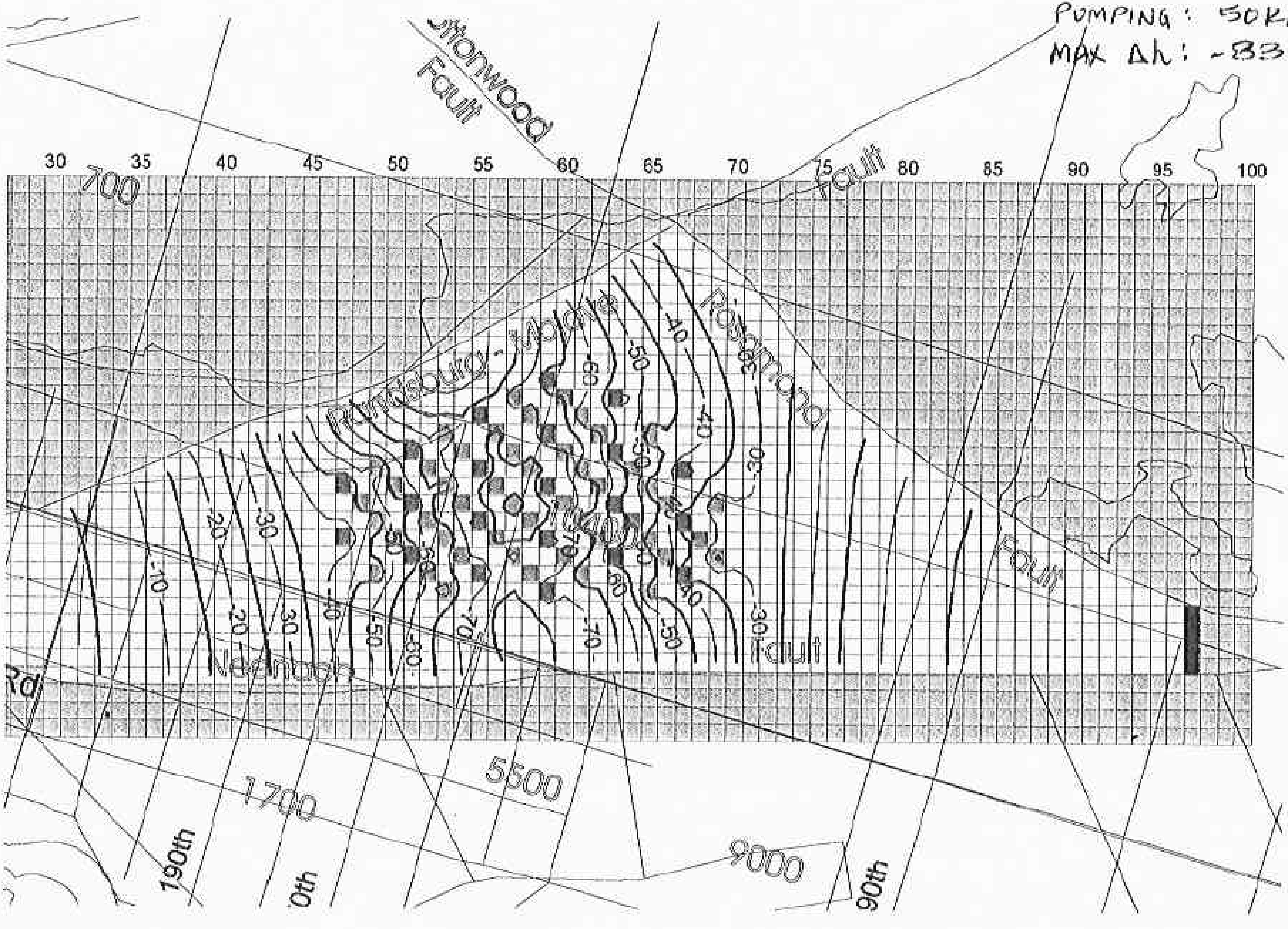
CONTOUR INTERVAL: 10'

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 6
PERIOD DURATION: 180^d
SIMUL. DURATION: 1080^d (3y)
RECHARGE: —
PUMPING: 50KAF
MAX Δh: -83'



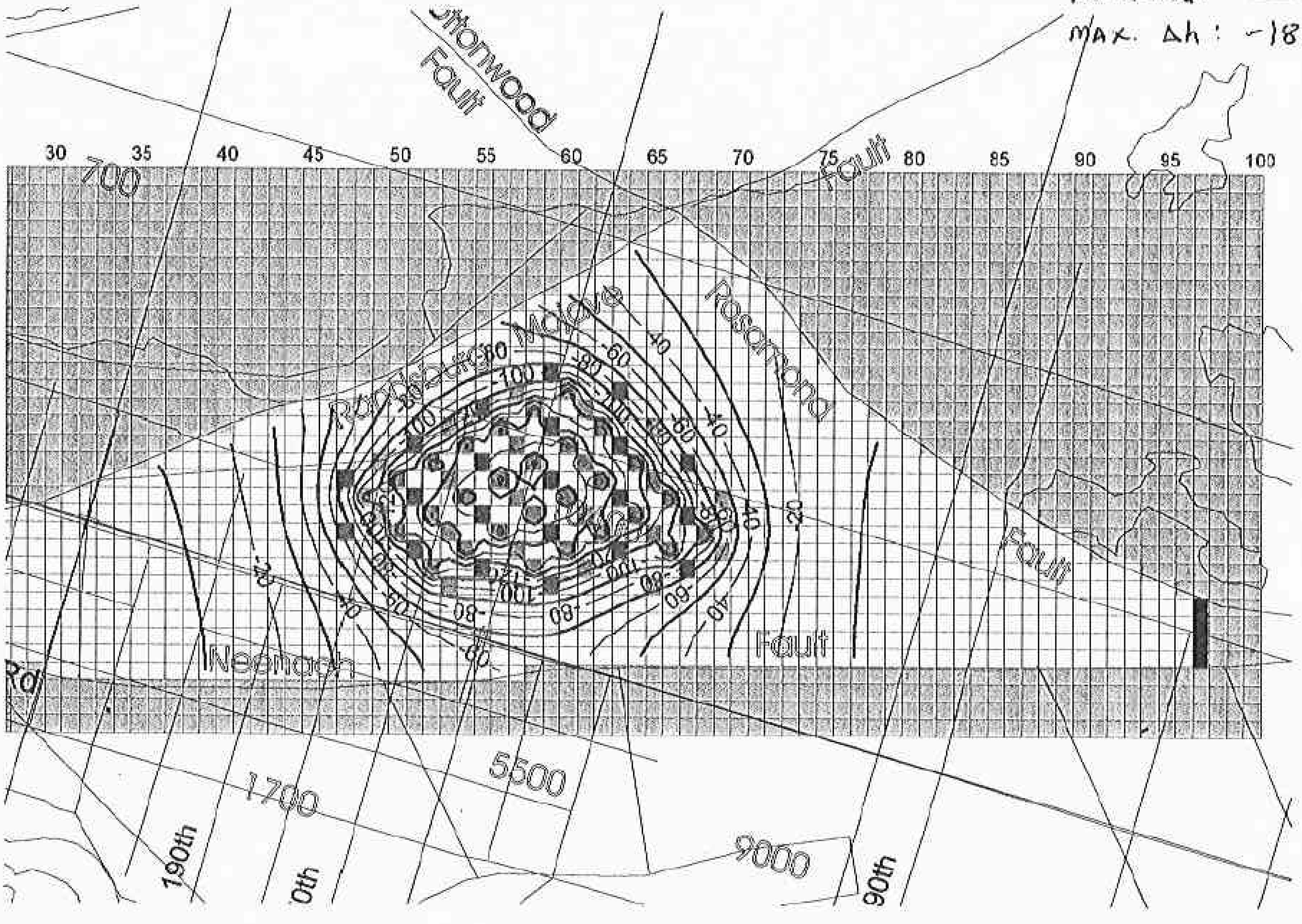
CONTOUR INTERVAL: 5'

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 5
PERIOD DURATION: 180^d
SIMUL. DURATION: 900^d (2.5)
RECHARGE: 100 KAF
PUMPING: —
MAX. Δh: -182'



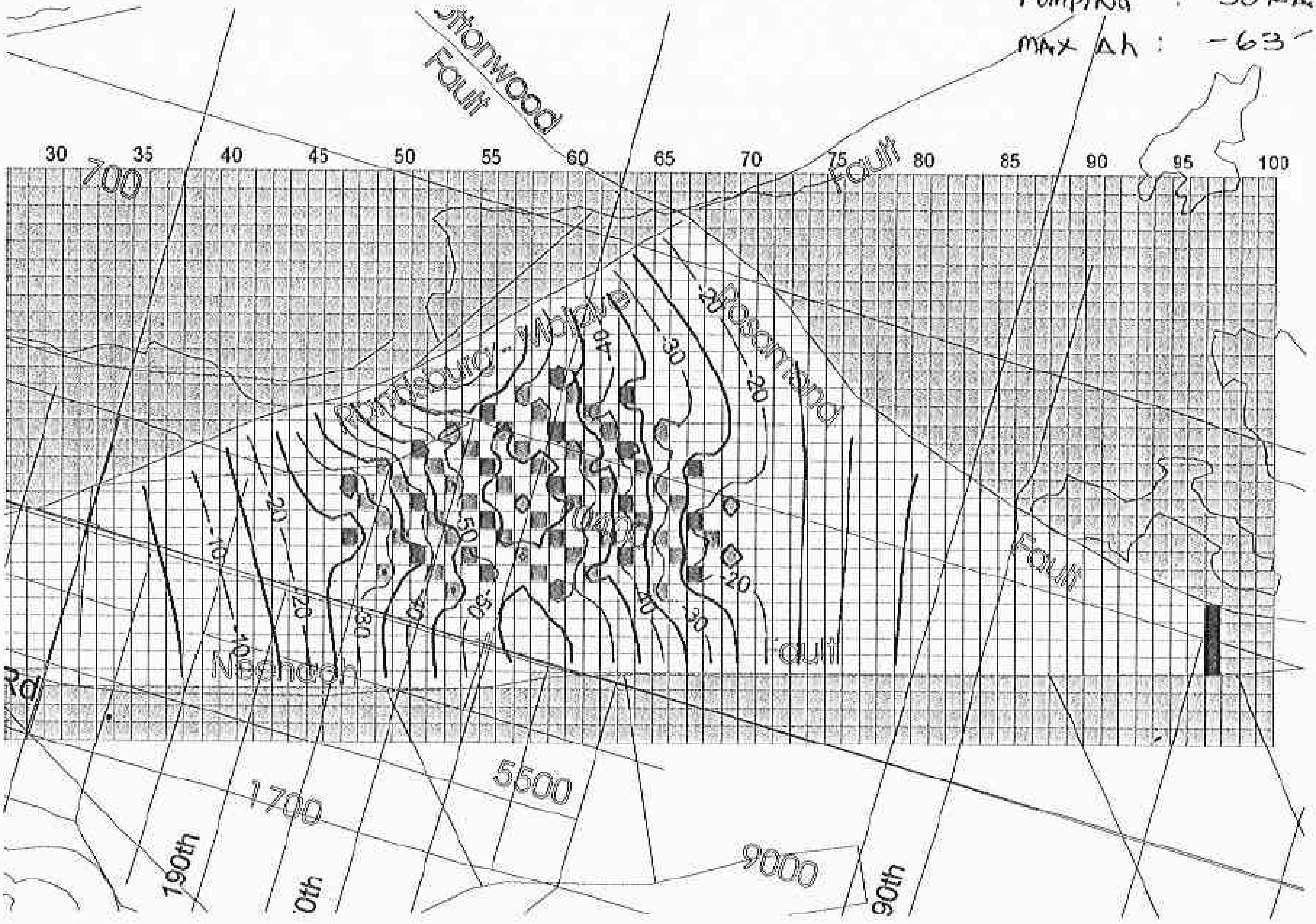
CONTOUR INTERVAL: 10'

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD : 4
PERIOD DURATION : 180 d
SIMUL. DURATION : 720 d (2y)
RECHARGE : ———
PUMPING : 50 KAF
MAX Δh : -63'



CONTOUR INTERVAL: 5'

100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 3

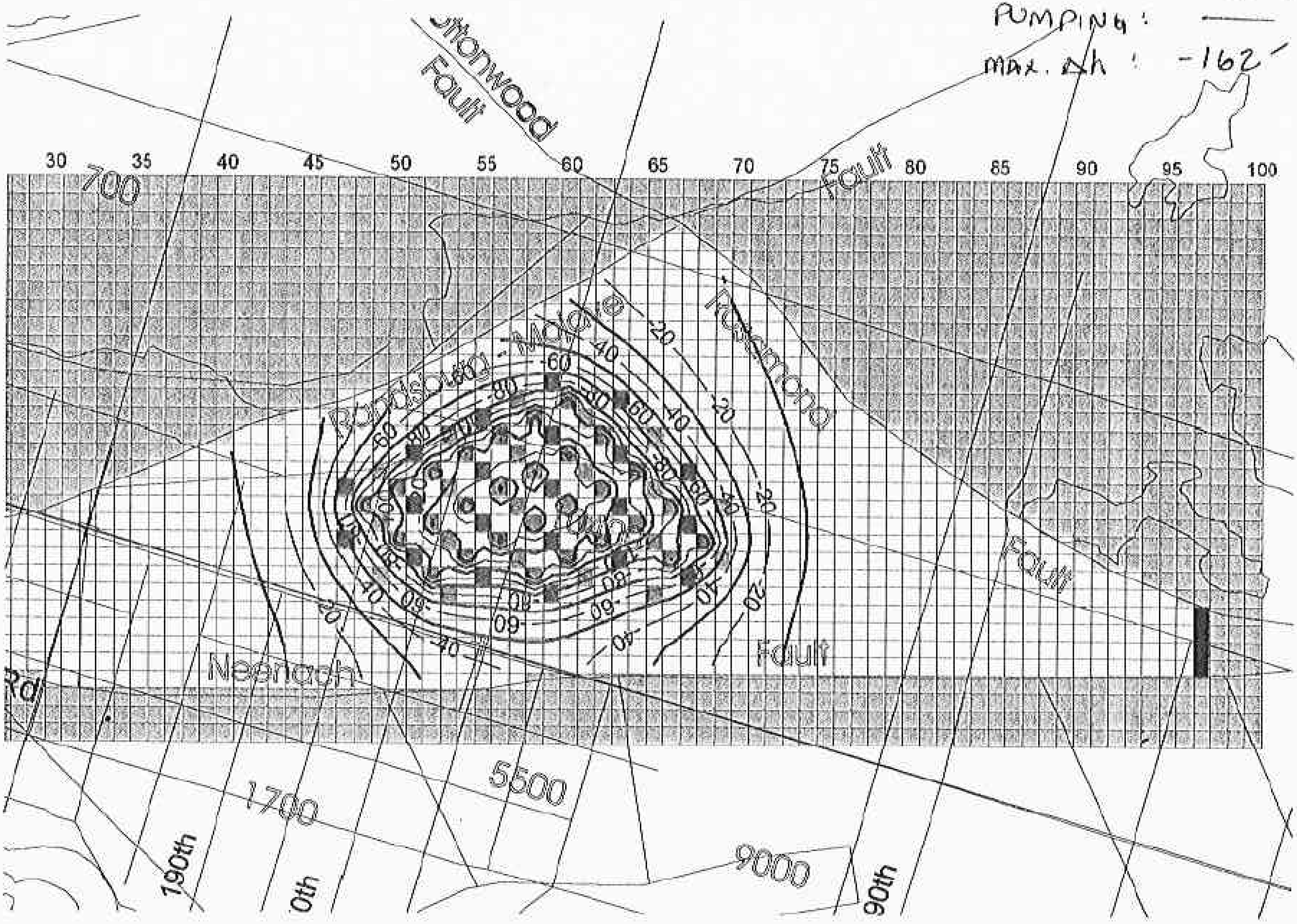
PERIOD DURATION: 180^{d}

SIMUL. DURATION: 540^{d} (1.5 y)

RECHARGE: 100KAF

PUMPING: —

MAX. Δh: -162'



CONTOUR INTERVAL: 10'

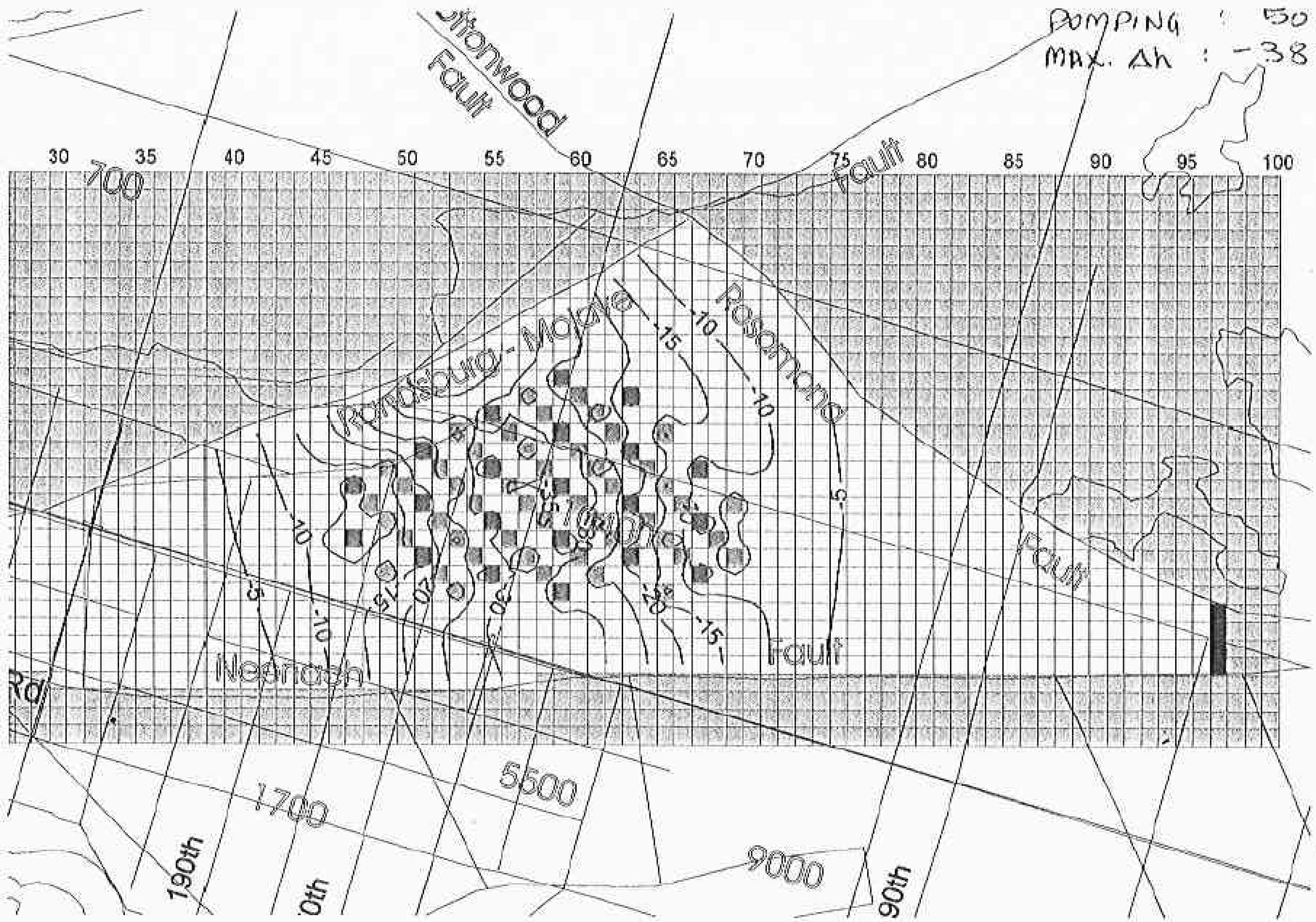
100,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD : 2
PERIOD DURATION : 180d
SIMUL. DURATION : 360d

RECHARGE : —
PUMPING : 50 KAF
MAX. Δh : -38'



CONTOUR INTERVAL: 5'

100,000 AF SCENARIO

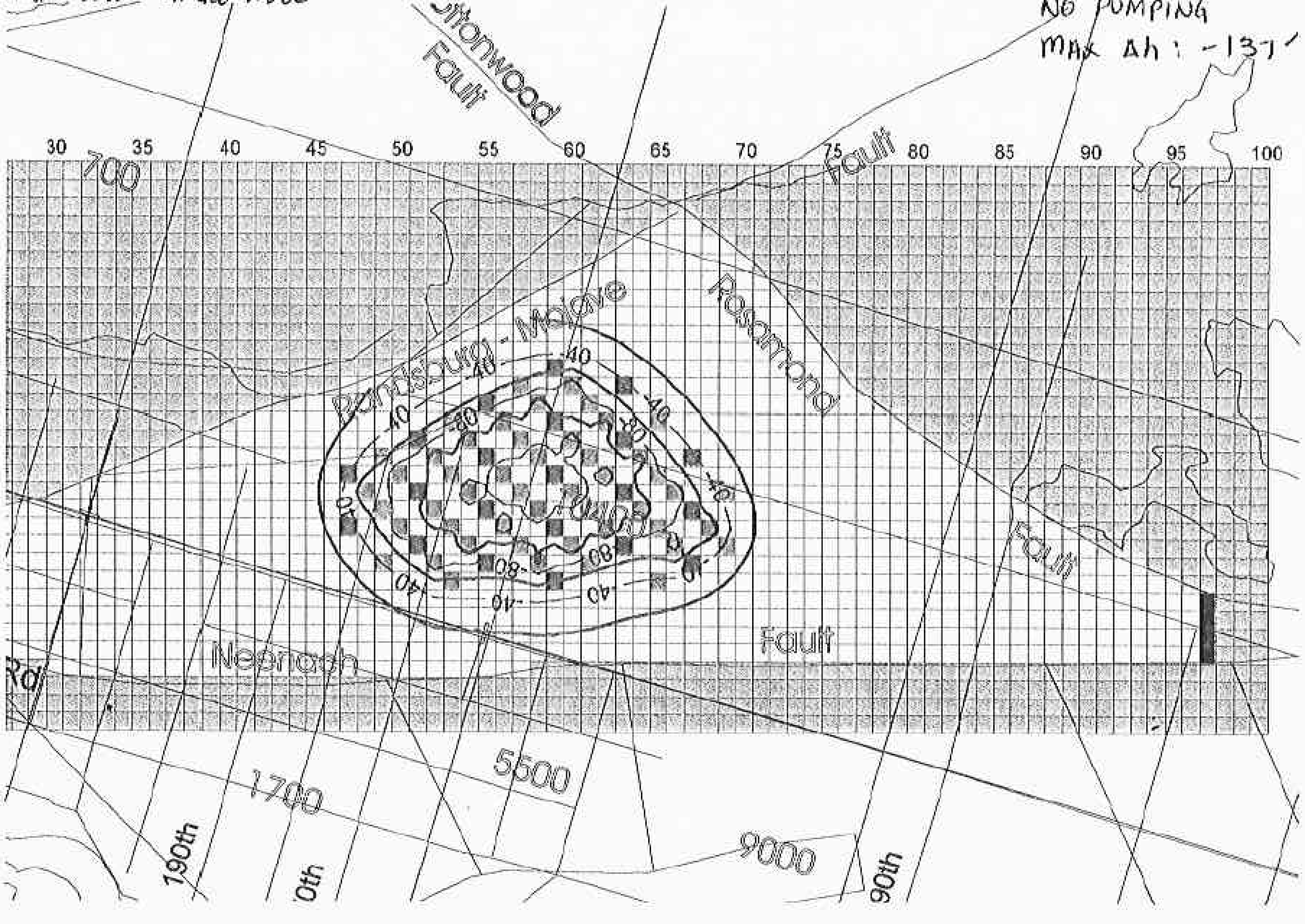
DRAWDOWN

- denotes mounding

STRESS PERIOD: 1
PERIOD DURATION: 180 d
SIMULATION DURATION: 180 d

BLUE CELL - recharge basin (40 ac)
RED CELL - SINGLE WELL
ORANGE CELL - SINGLE WELL

RECHARGE: 100 KAF
NO PUMPING
MAX Δh: -137'



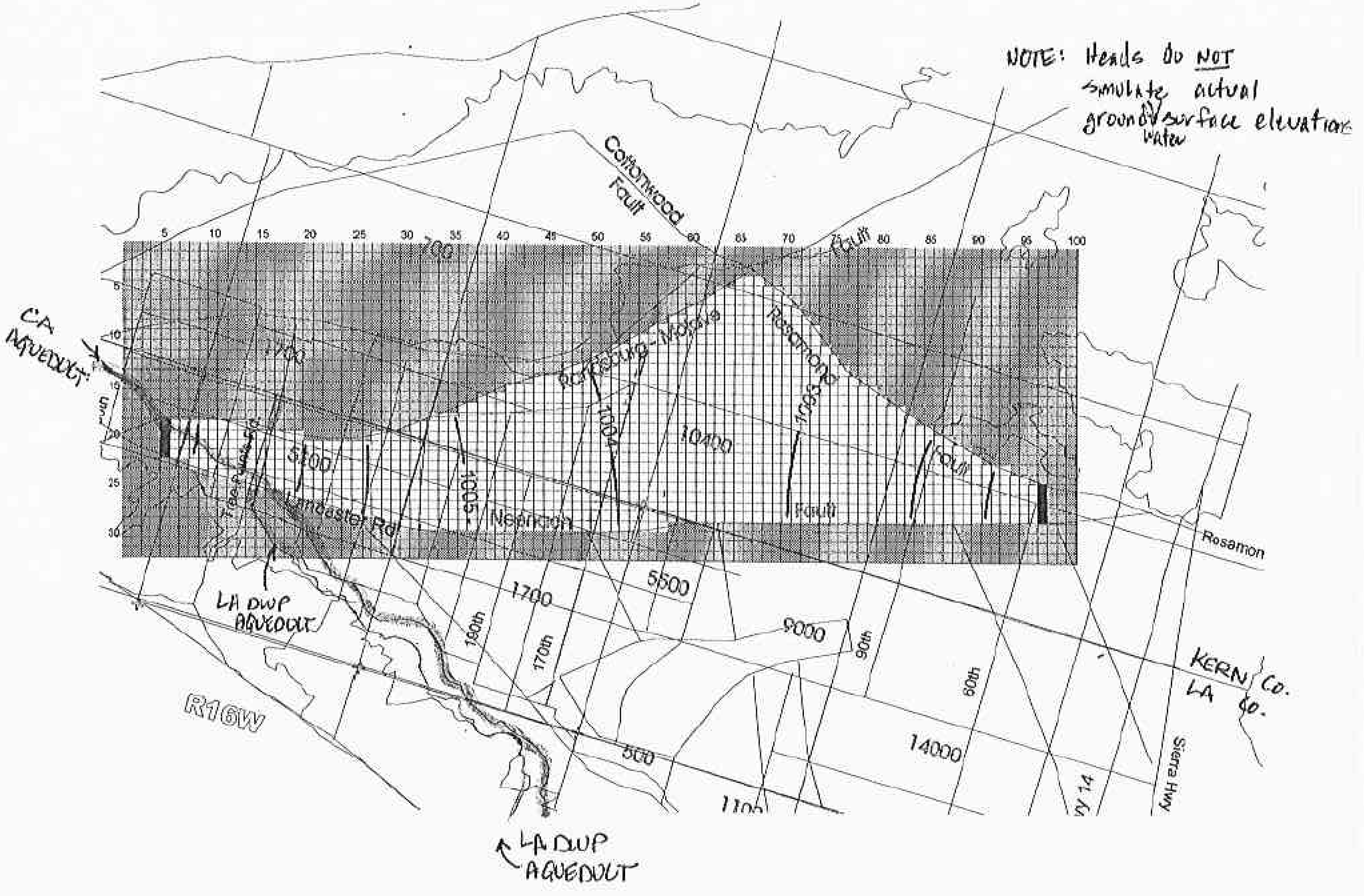
CONTOUR INTERVAL: 20'

MODEL CELLS: 1320' x 1320' (40 acres)

STARTING HEADS

100KAF & 50KAF SCENARIOS

NOTE: Heads do NOT simulate actual ground water surface elevations

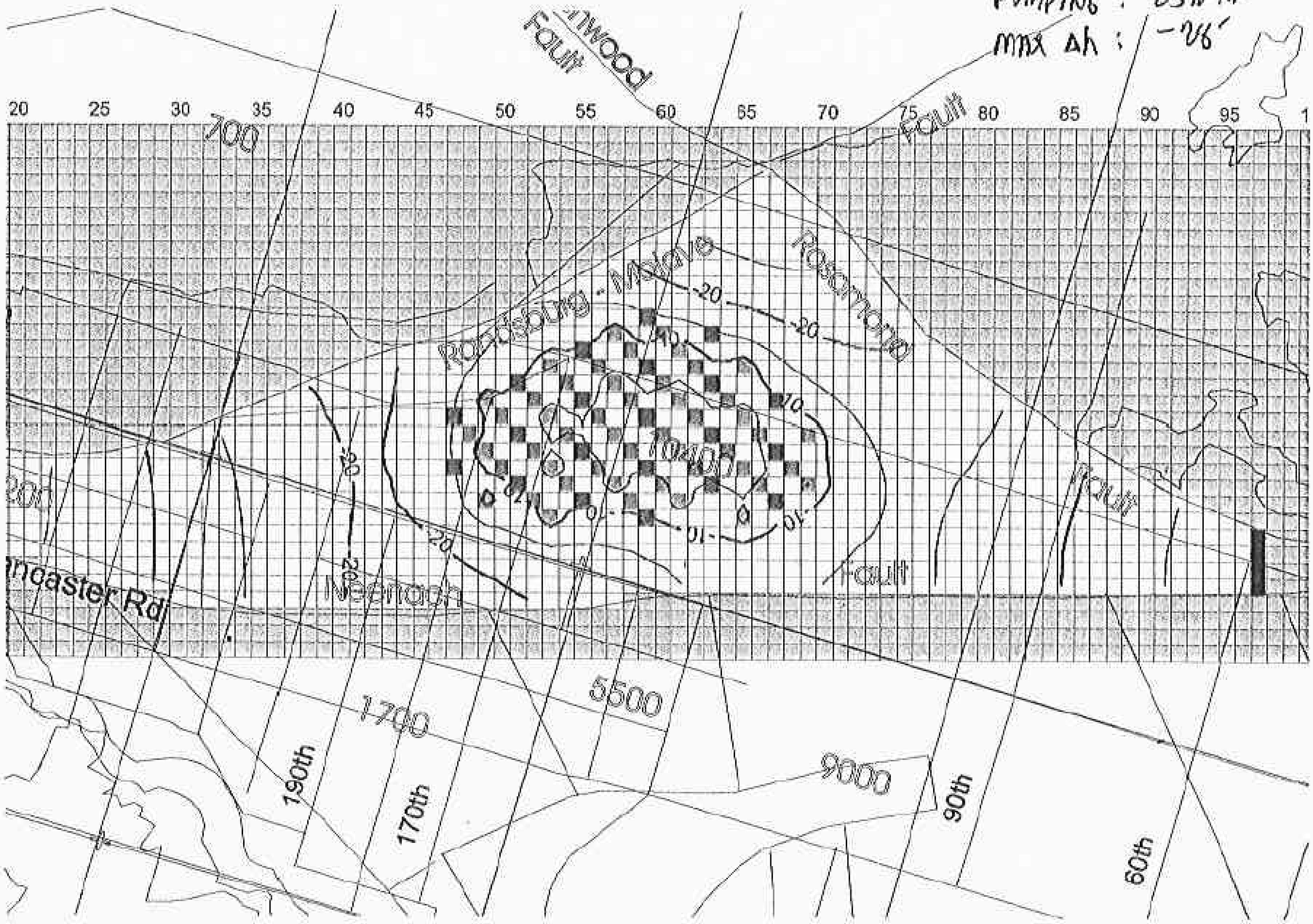


50,000 AF SCENARIO

DRAWDOWN

(END OF SIMULATION)

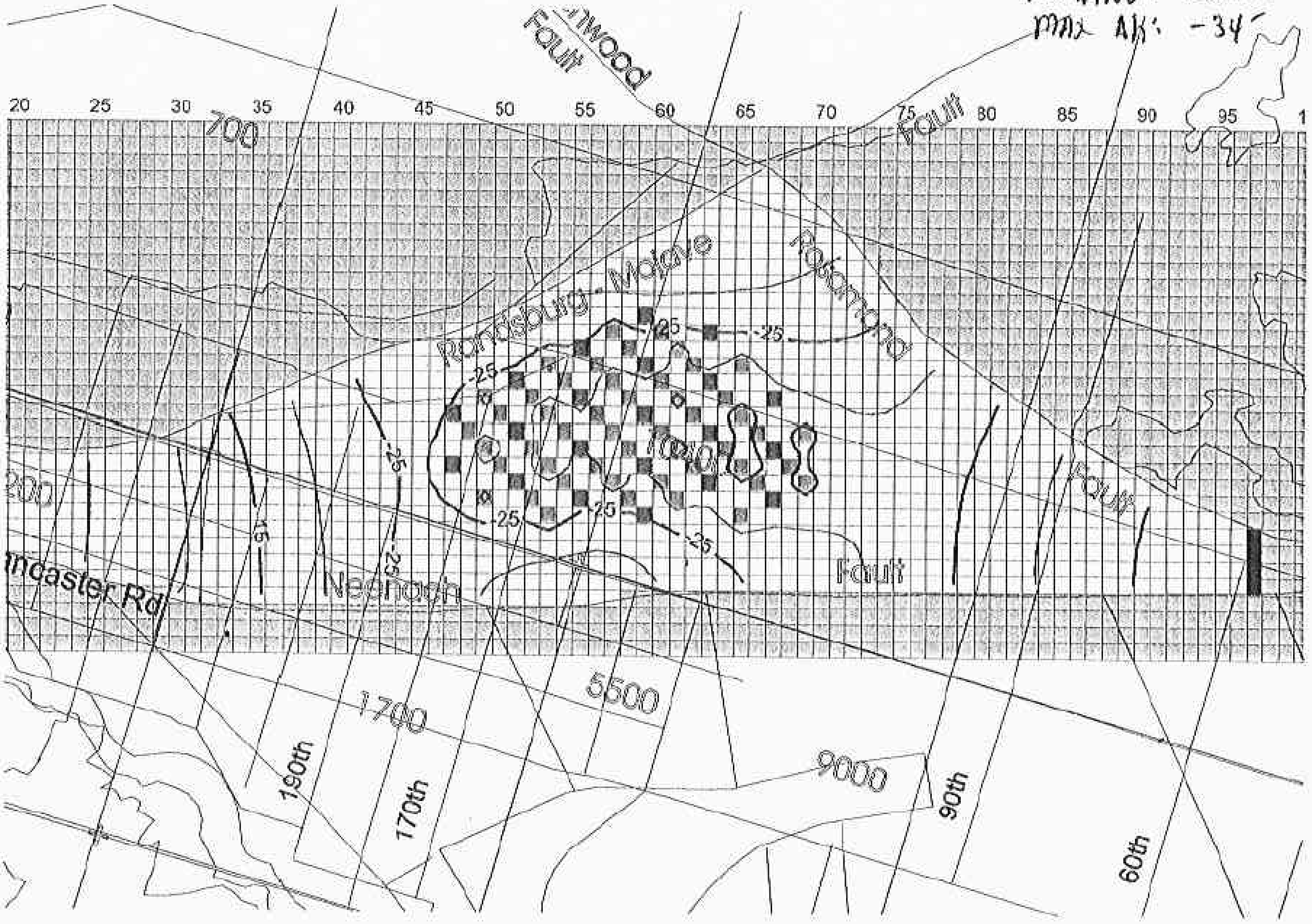
STRESS PERIOD: 13
PERIOD DURATION: 360d
SIMUL DURATION: 2880d 8y
RECHARGE: ——
PUMPING: 2511 AF
MAX Δh: −26'



20,000 AF SCENARIO

DRAWDOWN

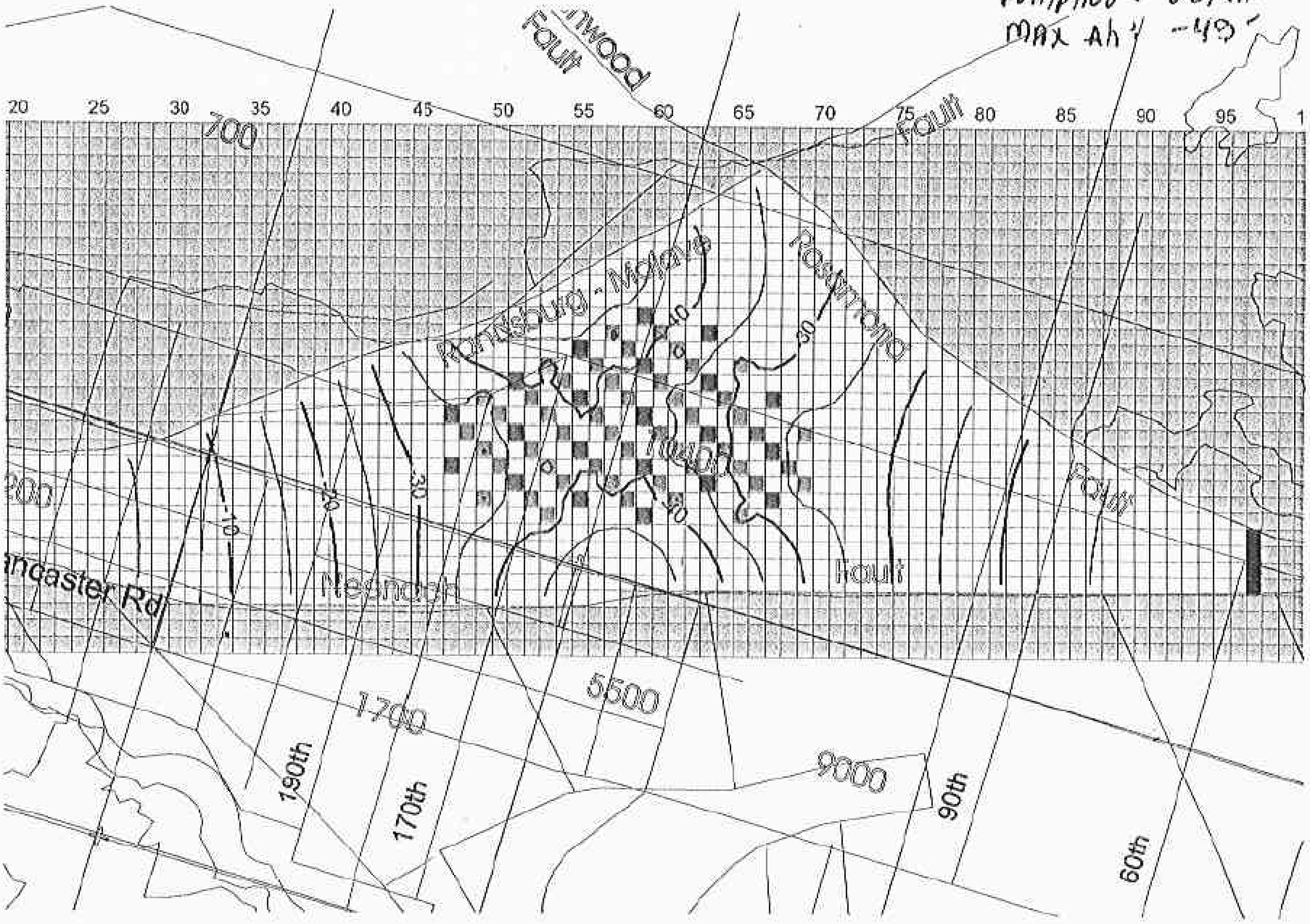
STRESS PERIOD: 12
PERIOD DURATION: 360d
SIMUL DURATION: 2520d 7y
RECHARGE —
PUMPING: 25KAF
MAX ΔH: -34'



50,000 AF SCENARIO

DRAWDOWN

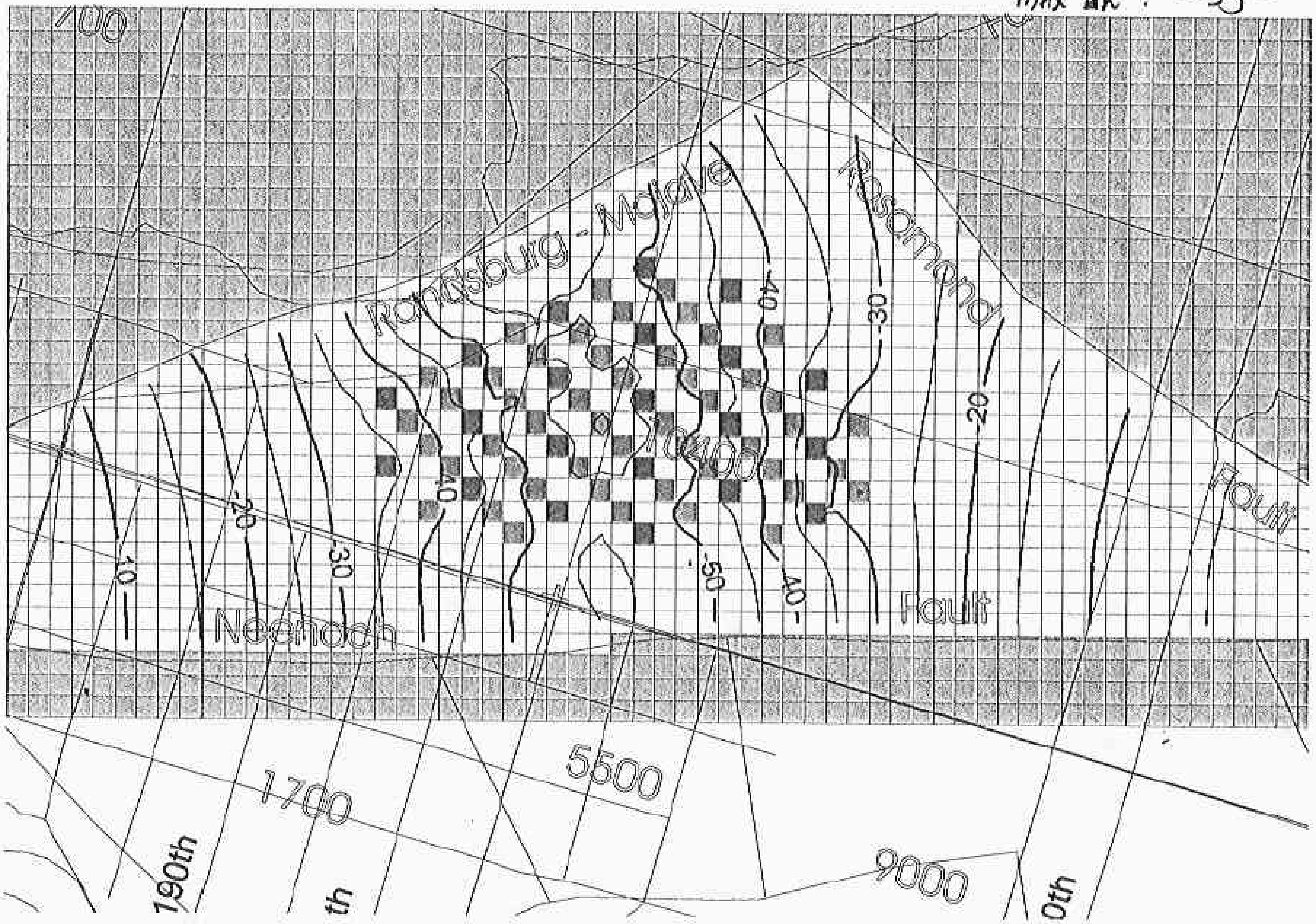
STRESS PERIOD: 11
PERIOD DURATION: 360d
SIMUL DURATION: 2160d 6 yr
RECHARGE: —
PUMPING: 25KAF
MAX Δh: -49'



50,000 AF SCENARIO

DRAWDOWN

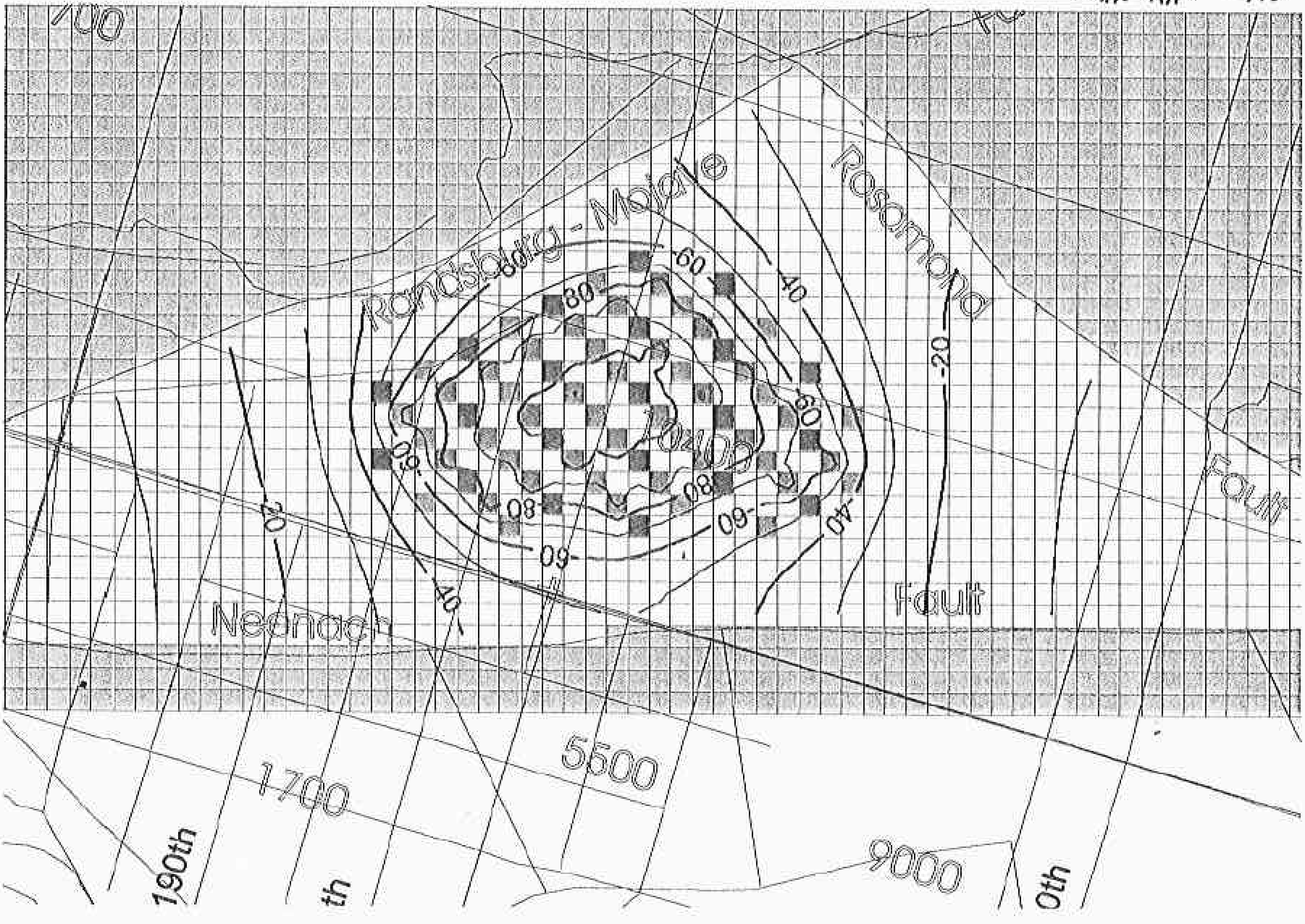
STRESS PERIOD: 10
PERIOD DURATION: 180d
SIMUL. DURATION: 1800d (5y)
RECHARGE: —
PUMPING: 25KAF
MAX Δh: -53-



50,000 AF SCENARIO

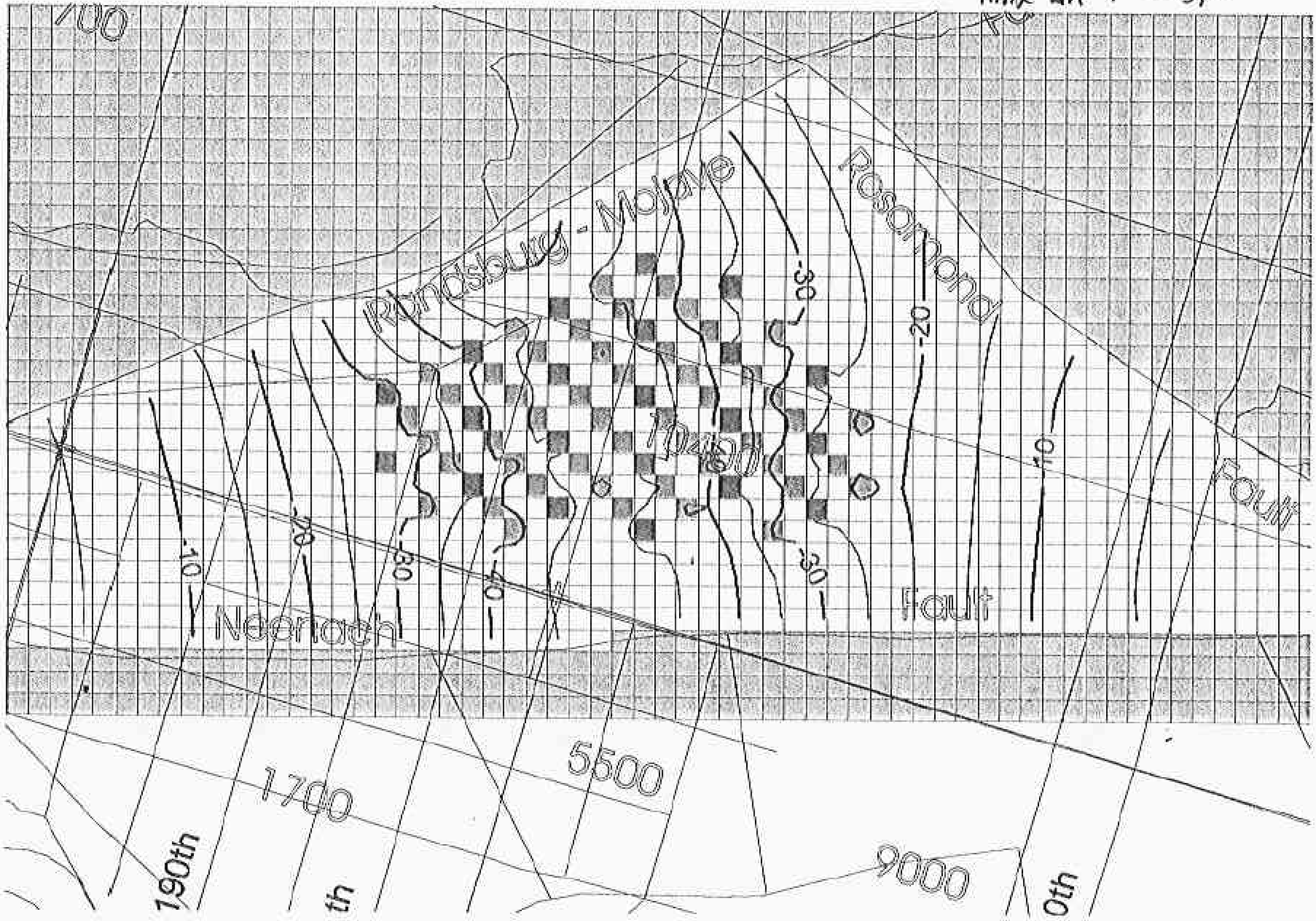
DRAWDOWN

STRESS PERIOD: 9
PERIOD DURATION: 180^{d}
SIMUL. DURATION: 1620^{d}
RECHARGE: 50KAF
PUMPING: —
MAX ΔH: ~110'



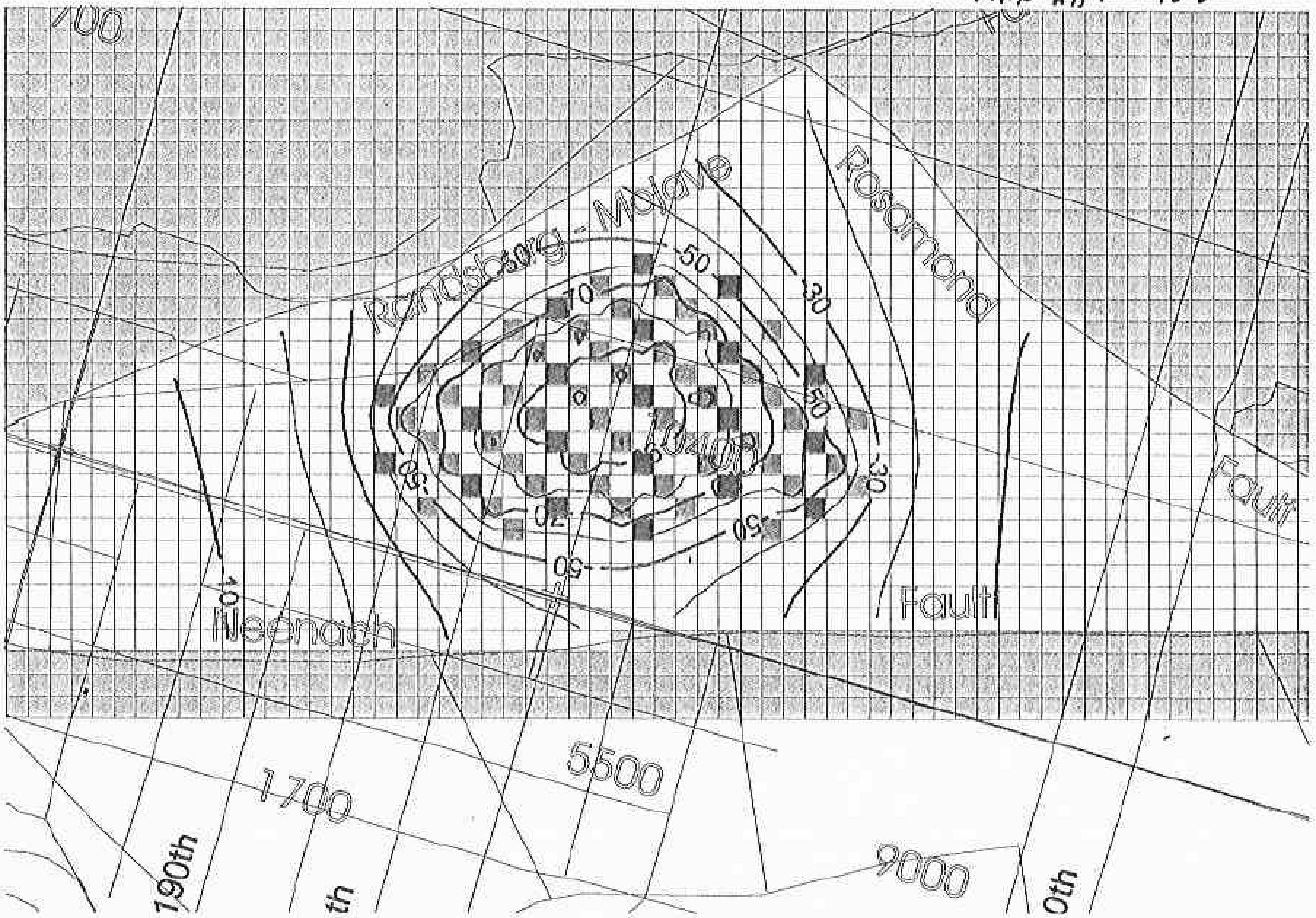
50,000 AF SCENARIO DRAWDOWN

STRESS PERIOD : 8
PERIOD DURATION: 180^{d}
SIMUL DURATION: 1440^{d} 4y
RECHARGE : —
PUMPING : 25KAF
MAX Δh : ~51



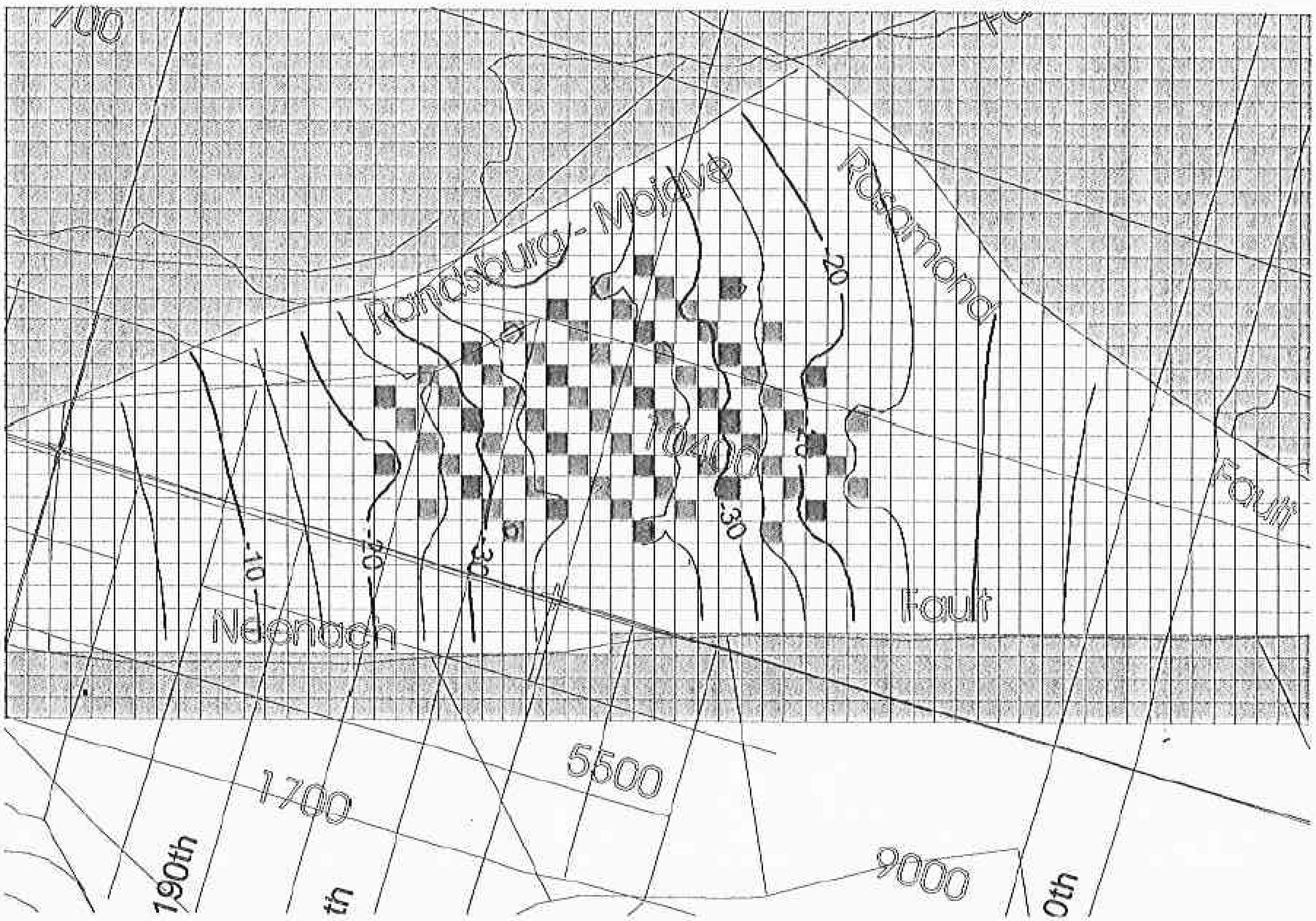
50,000 AF SCENARIO DRAWDOWN

STRESS PERIOD: 7
PERIOD DURATION: 180d
SIMUL DURATION: 1260d
RECHARGE: 50KAF
PUMPING: ——
MAX Δh: -102



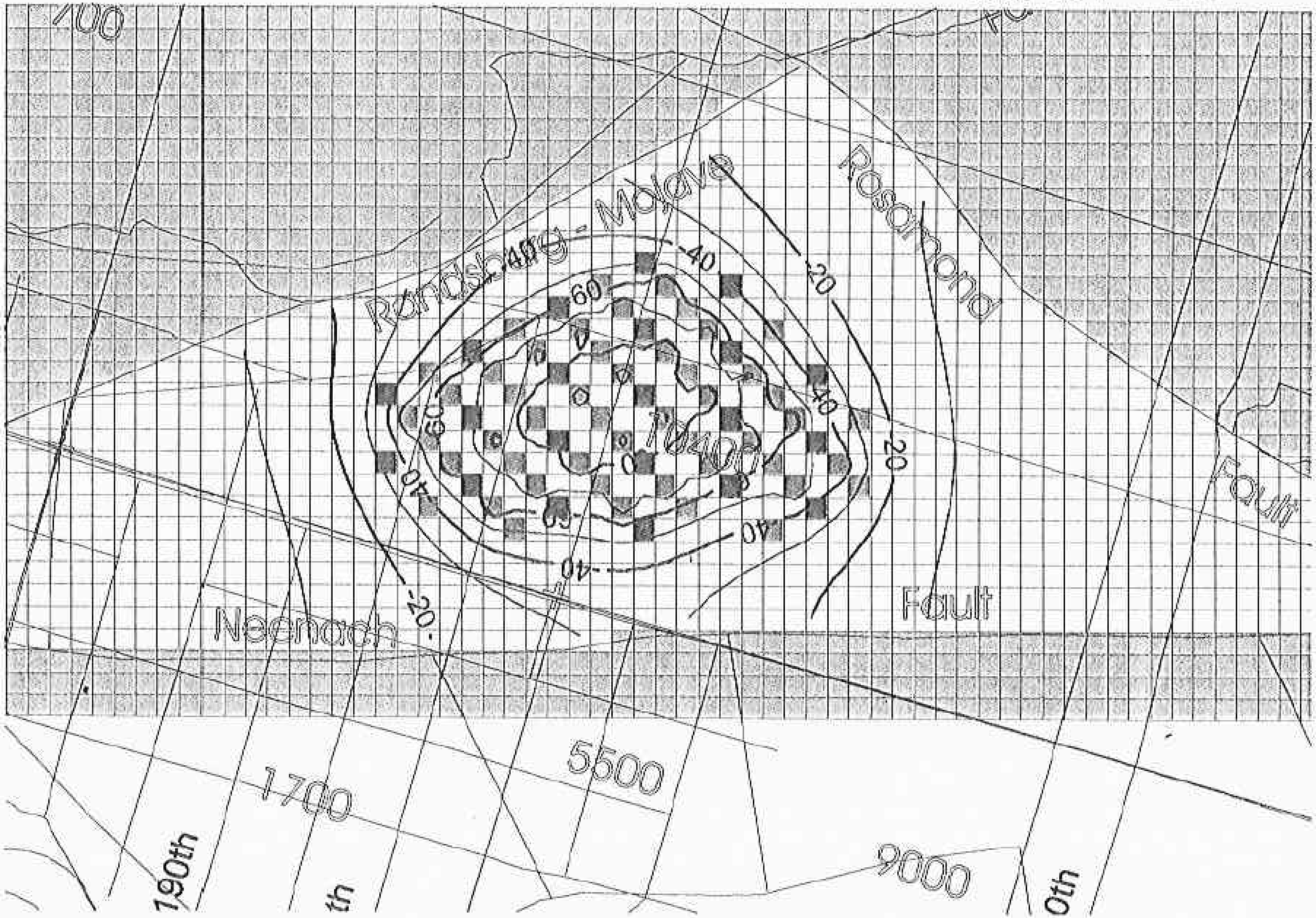
150,000 AF SCENARIO DRAWDOWN

STRESS PERIOD: 4
PERIOD DURATION: 180^d
SIMUL. DURATION: ~~1260^d~~ 1080^d (3.5 y)
RECHARGE: ——
PUMPING: 25KAF
MAX Δh: −41′



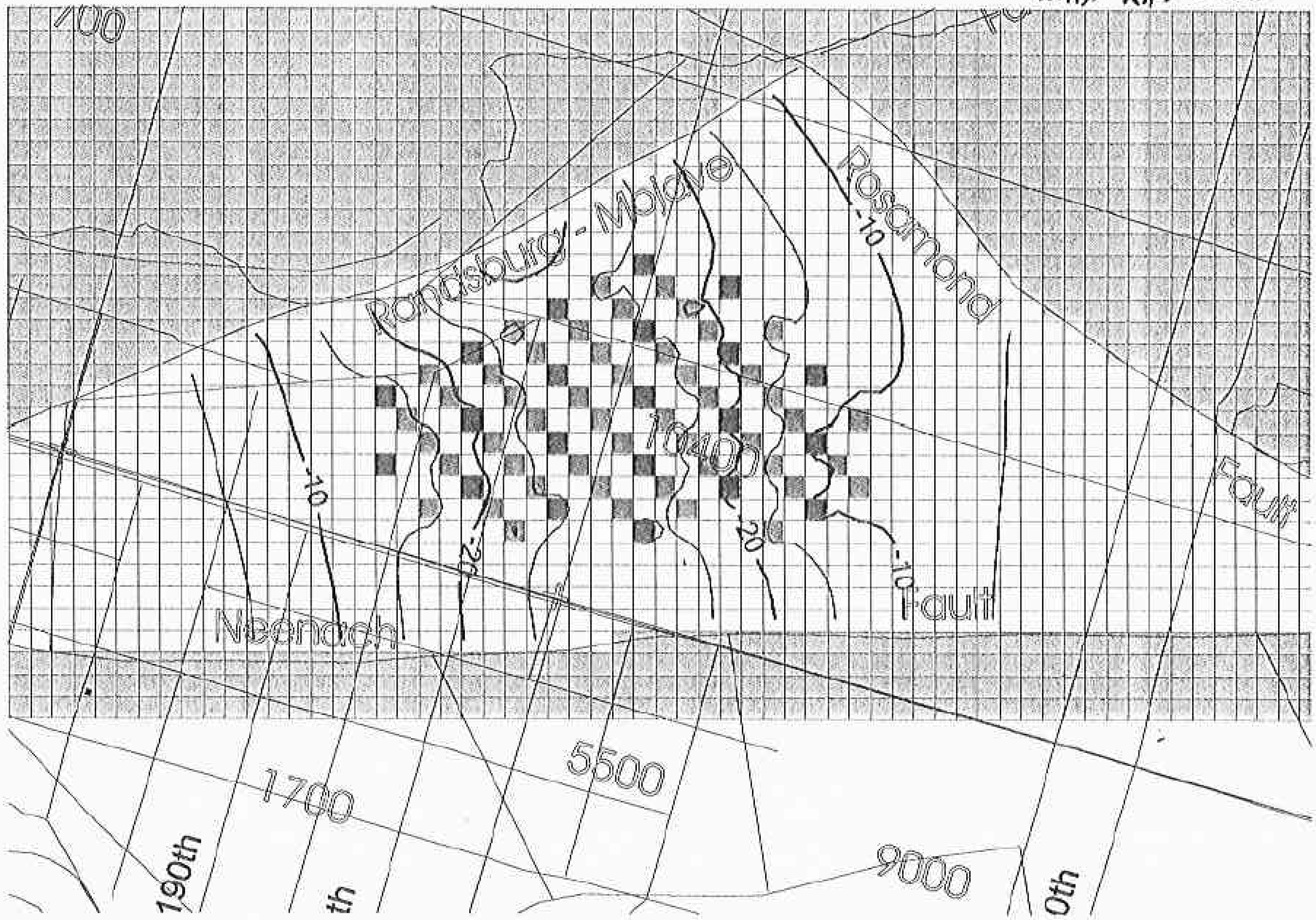
50,000 AF SCENARIO DRAWDOWN

STRESS PERIOD: 5
PERIOD DURATION: 180^d
SIMUL DURATION: 900^d
RECHARGE: 50 KAF
PUMPING: —
MAX Δh: -93



50,000 AF SCENARIO DRAWDOWN

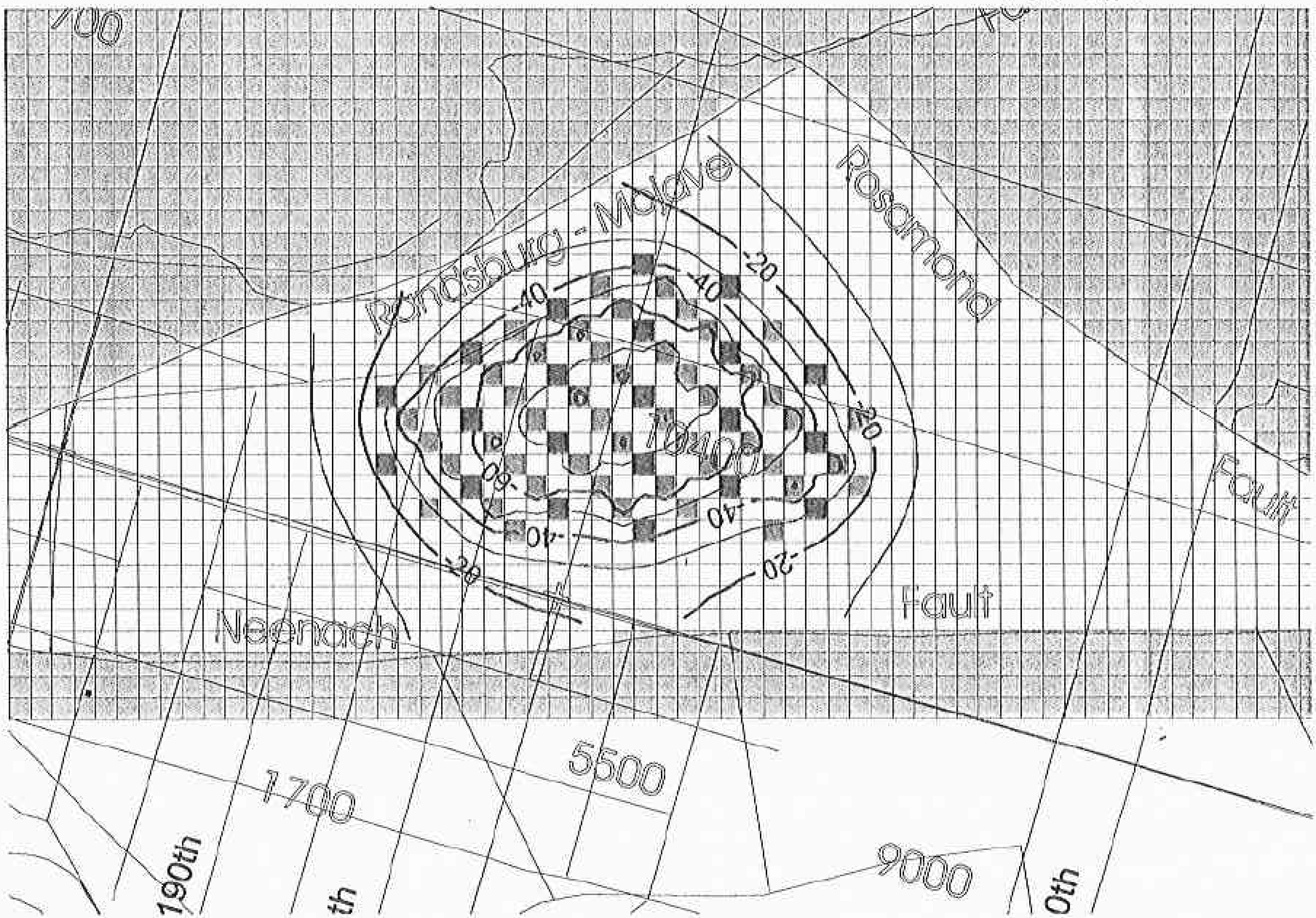
STRESS PERIOD: 4
PERIOD DURATION: 180 d
SIMULATION DURATION: 720 d
RECHARGE: —
PUMPING: 25 KAF
MAX Δh: -32'



50,000 AF SCENARIO

DRAWDOWN

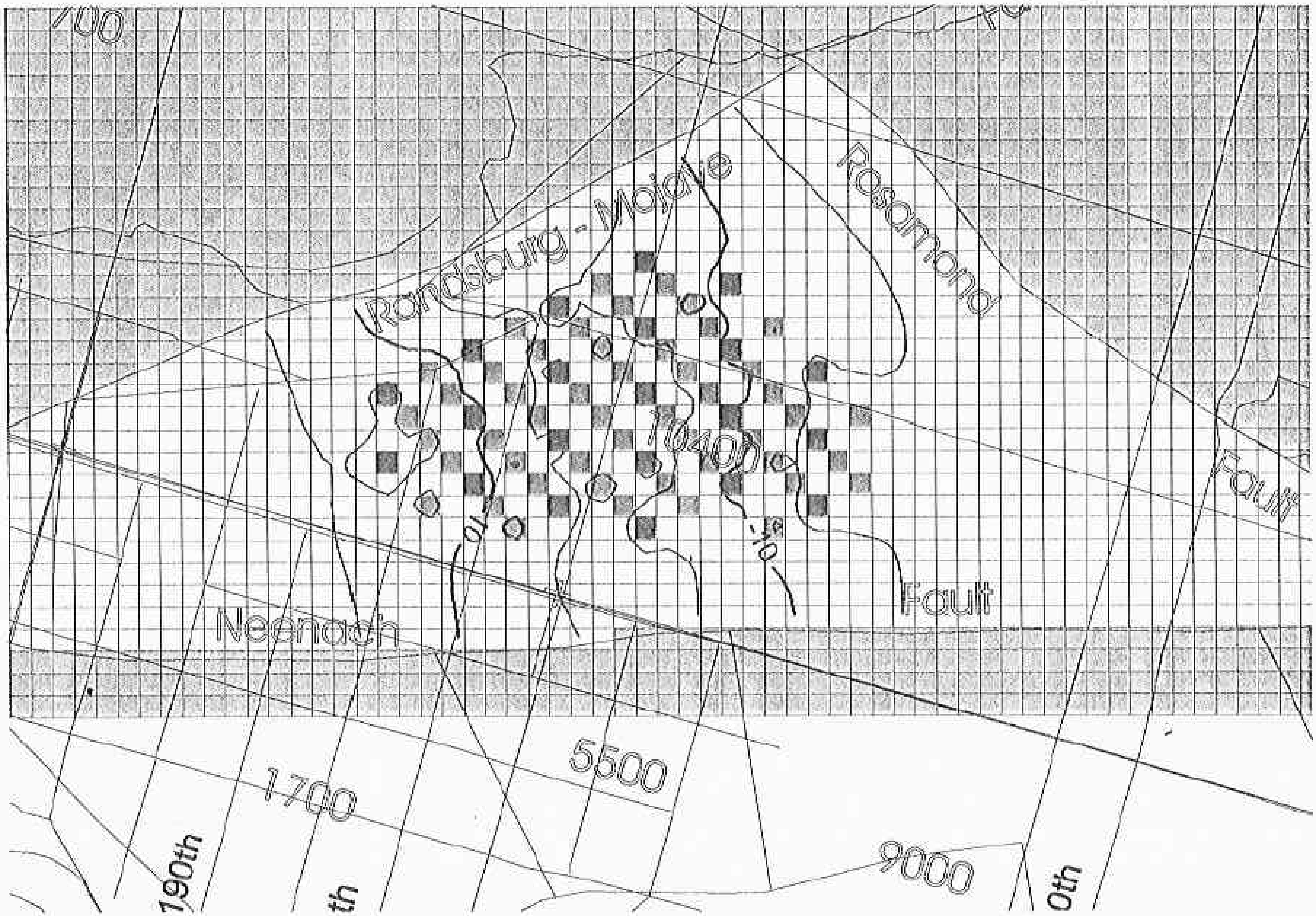
STRESS PERIOD: 3
PERIOD DURATION: 180 d
SIMUL DURATION: 540 d
RECHARGE: 25K AF
PUMPING: —
MAX Δh: -82



30,000 AF SCENARIO

DRAWDOWN

STRESS PERIOD: 2
PERIOD DURATION: 180 d
SIMUL. DURATION: 360 d
RECHARGE: ———
PUMPING: 25 KAF
MAX Δh: -19'

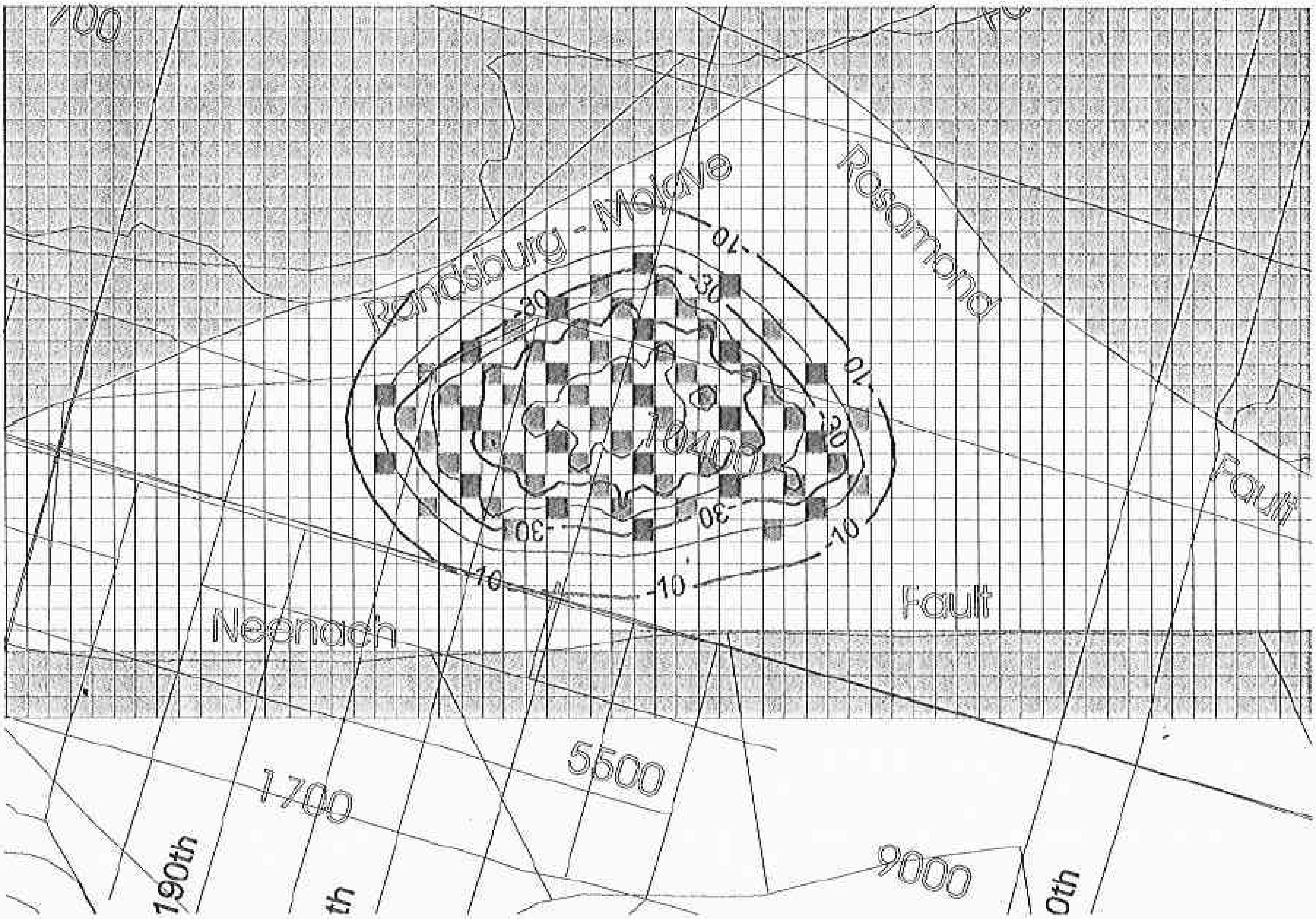


50,000 AF SCENARIO

DRAWDOWN

- denotes mounding

STRESS PERIOD: 1
PERIOD DURATION: 180[d]
SIMUL. DURATION: 180[d]
RECHARGE: 50 KAF
PUMPING:
MAX Δh: -70



JD AF SCENARIO

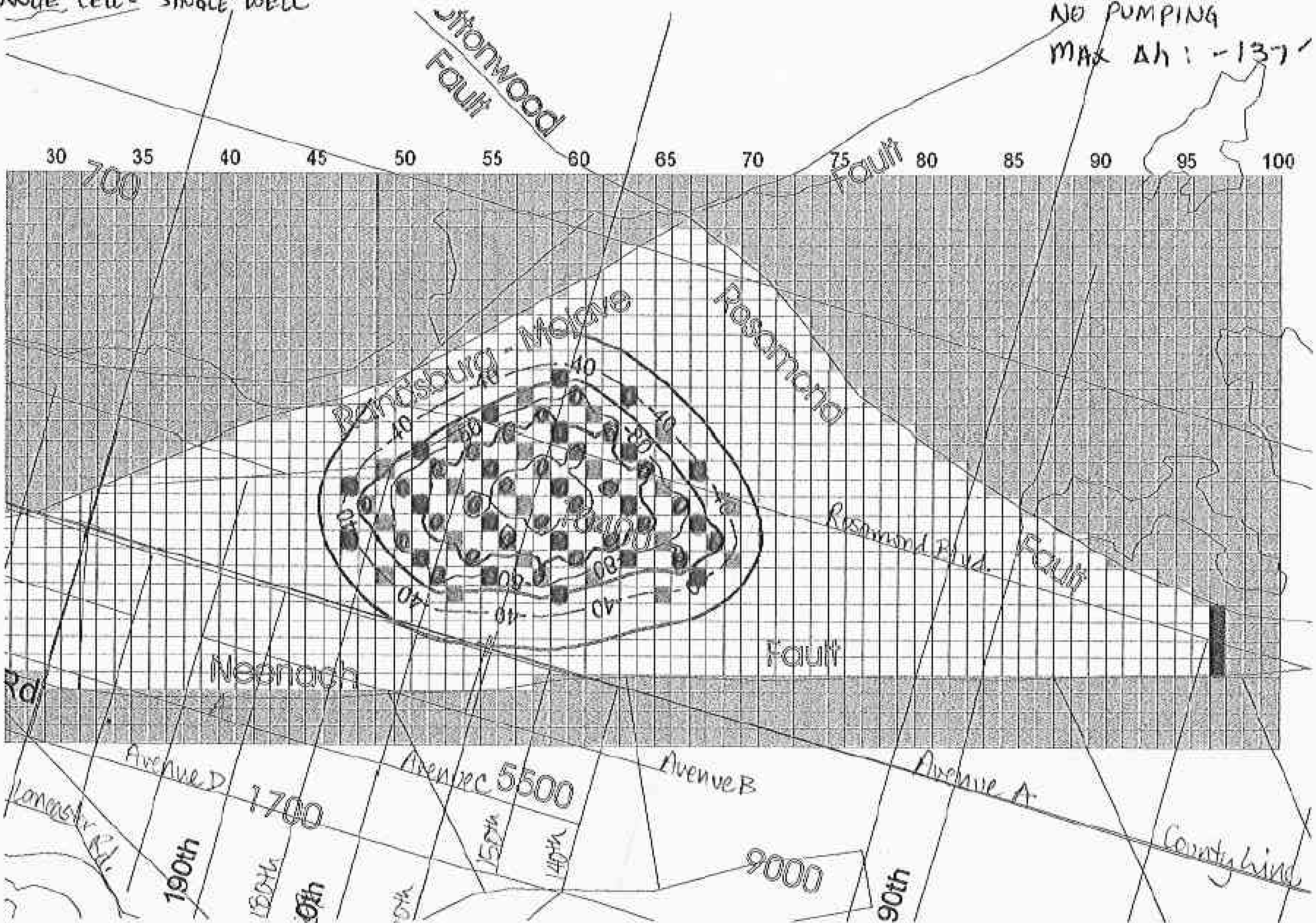
DRAWDOWN

- denotes mounding

STRESS PERIOD: 1
PERIOD DURATION: 180 d
SIMULATION DURATION: 180 d

Blue cell - recharge basin (40 ac)
Red cell - single well
Orange cell - single well

RECHARGE: 100 KAF
NO PUMPING
MAX Δh: -137'



CONTOUR INTERVAL: 20'

5280 < 3960
2640
1320

100,000 AF SCENARIO

(END OF SIMULATION)

DRAWDOWN

- denotes mounding

STRESS PERIOD : 13

PERIOD DURATION: 360 d

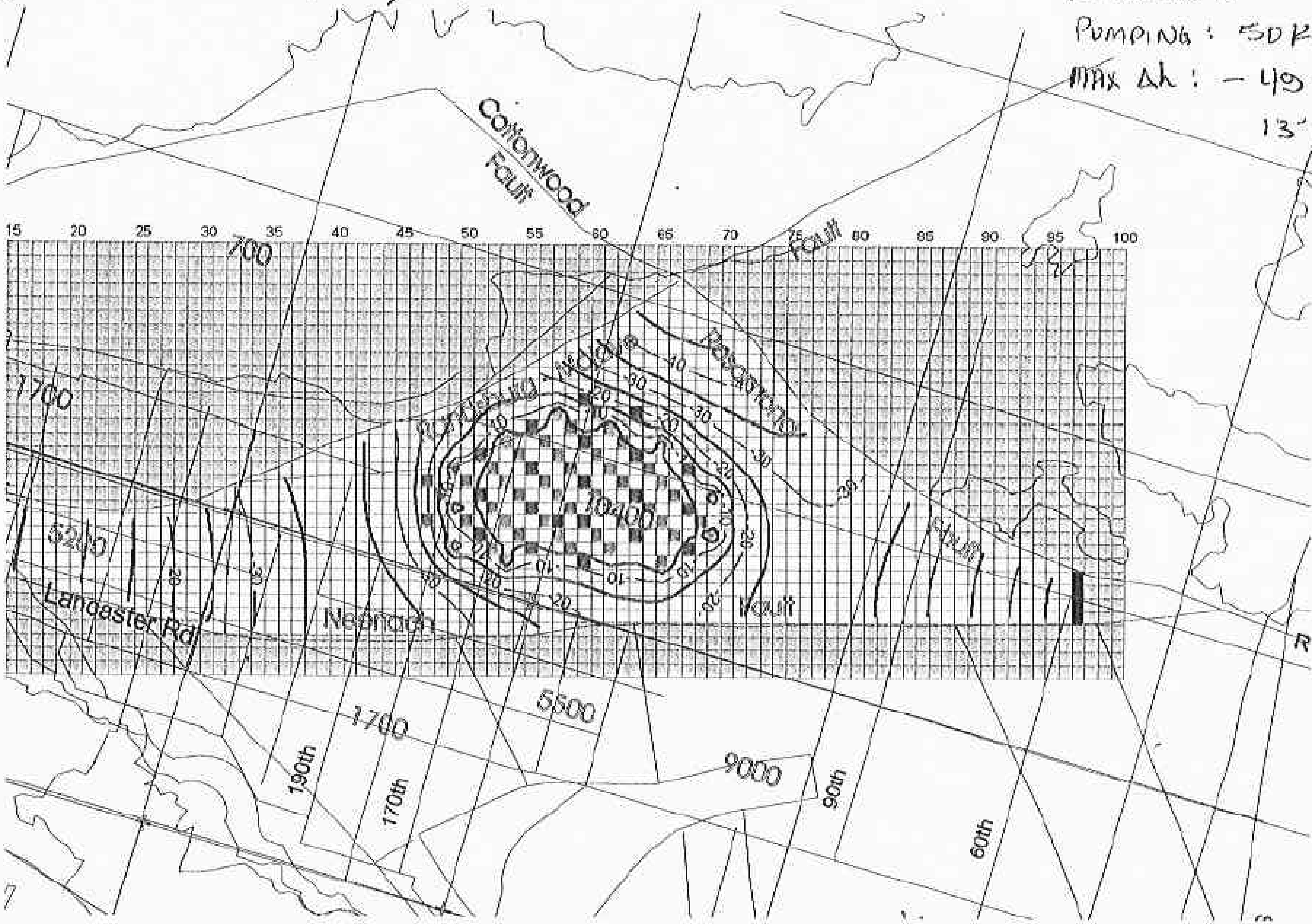
SIMUL. DURATION: 2880 d (8 ...

RECHARGE : —

PUMPING : 50 KAF

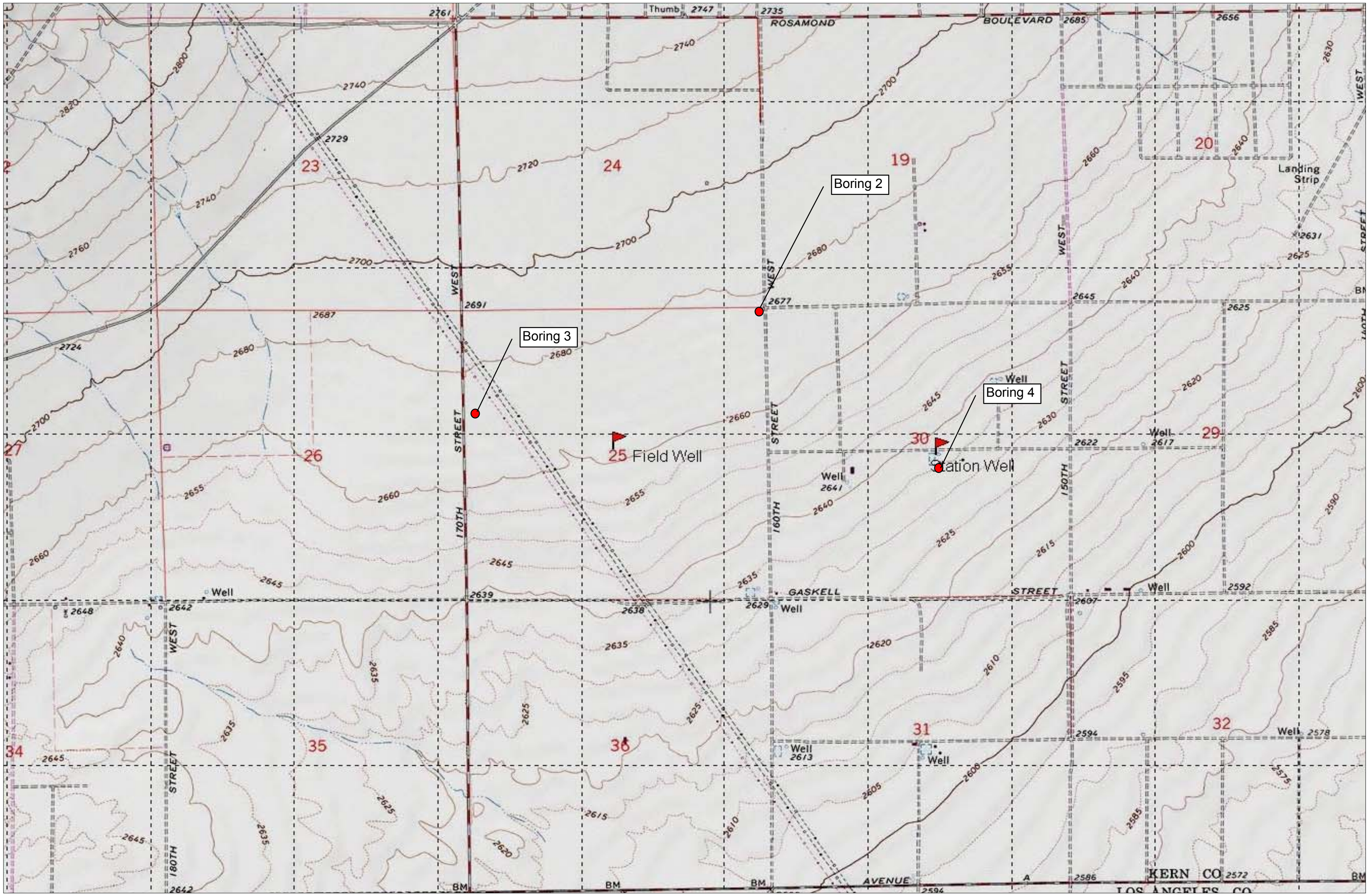
MAX Δh : − 49′ (residual mounding)

13′ (drawdown)



CONTOUR INTERVAL: 5′

Appendix F
Analytical Results



Boring 2
Boring 3
Boring 4
Field Well
Station Well
ROSAMOND
BOULEVARD
GASKELL
STREET
AVENUE
WEST
170TH
STREET
160TH
150TH
180TH
Landing Strip
Thumb
Well
KERN CO
LOS ANGELES CO

Parameter	Units	Station Well	Field Well	Boring Van Dam #3	Boring Van Dam #3	Boring Van Dam #4	Boring Van Dam #4	USEPA MCL	CA MCL	CA DHS PHG	USEPA Secondary MCL	CA DHS Secondary MCL
Lab ID		A3F0436-01	A3F0436-02	CMG0155-01	CMG0155-01	CMH0004-01	CMH0004-01					
Latitude		N34deg50.441'	N34deg50.460'									
Longitude		W118deg24.264'	W118deg25.398'									
Filtered?		**NO**	**NO**	**NO**	**YES**	**NO**	**YES**					
Total Hardness	mg/l	52	85	130		180						
Calcium	mg/l	17	28	31	19	35	18					
Magnesium	mg/l	2	3.6	13	2.3	22	2.1					
Sodium	mg/l	36	30	36	34	36	33					
Potassium	mg/l	1.8	1.9	5.1	2.2	6.6	2.3					
Total Alkalinity	mg/l	98	120	110		130						
Hydroxide	mg/l	<3	<3.0	<2		<2						
Carbonate	mg/l	<3	<3.0	8		<2						
Bicarbonate	mg/l	120	150	100		130						
Sulfate	mg/l	12	13	14		24					250	250-500
Chloride	mg/l	8.9	8.9	8.2		11					250	250-500
Nitrate	mg/l	2.3	2.5	9		11		10	10-45	10-45		
Fluoride	mg/l	0.3	0.2	<0.5		<0.5		4	2	1	2	
pH	units	8.1	7.9	8.05		7.84		6.8-8.5				
Specific Conductance	umhos/cm	280	320	260		320						900-1600
Total dissolved solids	mg/l	180	210	200		240					500	500-1000
Total suspended solids	mg/l	<5	<5	460		3600						
Total organic carbon	mg/l	<0.7	<0.7	2.1		3.9						
Color	Units	3	3	19		19					15	15
Odor	TON	<1	<1	<1		<1					3	3
Turbidity	NTUs	1.5	1.9	990		2600						5
MBAS (foaming agents)	mg/l	<0.05	<0.05	<0.4		<0.1					0.5	0.5
Cyanide	mg/l	<0.1	<0.1	<0.025		<0.025		0.2	0.15	0.15		
Nitrite as N	mg/l	<0.1	<0.1	<0.15		0.17		1	1	1		
Total phosphorous	mg/l	<0.05	<0.05	0.15		1.1						
Aluminum	ug/l	<50	<50	240	<50	39000	<50	50 to 2000	1000	600	50-200	200
Antimony	ug/l	<6	<6.0	<2	<2	<2	<2	6	6	20		
Arsenic	ug/l	<2	<2.0	5.4		8.5	1.4	10	Pending	0.004		
Arsenic (filtered)	ug/l	2	<2.0		<1							
Barium	ug/l	<100	<100	180	36	250	30	2000	1000	700		
Berylium	ug/l	<1	<1	0.67	<0.5	0.92	<0.5	4	4	1		
Boron	ug/l	<100	<100	<50	<50	<50	<50					
Cadmium	ug/l	<1	<1	<1	<1	<1	<1	5	5	0.07		
Total chromium	ug/l	16	9.7	57	<5	82	<5	100	50			
Hexavalent chromium	ug/l	16	9.7	<1		<10		100	50			
Copper	ug/l	21	<10	44	<10	56	<10	1300	1300	170	1000	1000
Iron	ug/l	110	42	35000	<40	56000	<40				300	300
Lead	ug/l	<5	<5.0	9.3	<5	13	<5	15 (90%)	15 (90%)	2		
Manganese	ug/l	<5	<10	620	57	1100	25				50	50
Mercury	ug/l	<1	<1.0	1.3	<0.2	1.9	<0.2	2	2	1.2		
Nickel	ug/l	<10	<10	43	<10	65	<10		100	12		
Selenium	ug/l	<5	<5.0	<5	<5	<5	<5	50	50			
Total silica	ug/l	18	23	60000	8700	50000	5000					
Silver	ug/l	<10	<10	<10	<10	<10	<10				100	100
Thallium	ug/l	<1	<1.0	<1	<1	<1	<1	2	2	0.1		
Zinc	ug/l	<10	<10	67	<20	120	24				5000	5000
Organics	ug/l	ND	ND	NA	NA	NA	NA					
Ethylene dibromide	ug/l	ND	ND	NA	NA	NA	NA					
Dibromochloropropane	ug/l	ND	ND	NA	NA	NA	NA					
Aldicarb	ug/l	ND	ND	NA	NA	NA	NA					
Aldicarb sulfone	ug/l	ND	ND	NA	NA	NA	NA					
Aldicarb sulfoxide	ug/l	ND	ND	NA	NA	NA	NA					
Carbaryl	ug/l	ND	ND	NA	NA	NA	NA					
Carbofuran	ug/l	ND	ND	NA	NA	NA	NA					
Methomyl	ug/l	ND	ND	NA	NA	NA	NA					
Oxamyl	ug/l	ND	ND	NA	NA	NA	NA					
Glyphosphate	ug/l	ND	ND	NA	NA	NA	NA					
Endothal	ug/l	ND	ND	NA	NA	NA	NA					
Nitrogen-phosphorous based pesticides via EPA Method 507 (13 compounds)	ug/l	ND	ND	NA	NA	NA	NA					
Organochlorine based pesticides and PCBs via EPA Method 508 (14 compounds)	ug/l	ND	ND	NA	NA	NA	NA					
Chlorinated herbicides via EPA Method 515.3 (8 compounds)	ug/l	ND	ND	NA	NA	NA	NA					
Volatile organic compunds via EPA Method 524.2 (68 compounds)	ug/l	ND	ND	NA	NA	NA	NA					
Semi-volatile organic compounds via EPA Method 525.2 (3 compounds)	ug/l	ND	ND	NA	NA	NA	NA					
Gross alpha	pCi/l	3.1	6.56					15	15			
Diquat		ND	ND									
Asbestos		ND	ND									

CA DHS PHG: California Department of Health Services Preliminary Health Goal
USEPA MCL: United States Environmental Protection Agency Maximum Contaminant Level for public water supplies
CA MCL: California Maximum Contaminant Level for public water supplies
ND: not detected
NA: not analyzed

E.S BABCOCK & SONS, INC.
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www.babcocklabs.com

Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	85	3.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Calcium	28	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Magnesium	3.6	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Sodium	30	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Potassium	1.9	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Total Cations	3.05	0.05	me/L	Calculation	06/12/03 15:15	lmt	
Anions							
Total Alkalinity	120	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Hydroxide	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Carbonate	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Bicarbonate	150	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Sulfate	13	0.50	mg/L	EPA 300.0	06/11/03 02:11	KOS	
Chloride	8.9	1.0	mg/L	EPA 300.0	06/11/03 02:11	KOS	
Nitrate as N	2.5	0.20	mg/L	EPA 300.0	06/11/03 02:11	KOS	
Fluoride	0.2	0.1	mg/L	SM 4500F C	06/12/03 21:59	imm	
Total Anions	3.11	0.05	me/L	Calculation	06/16/03 06:48	saf	
Aggregate Properties							
pH	7.9	1.0	pH Units	SM 4500H+ B	06/10/03 19:51	imm	
Specific Conductance	320	1.0	umhos/cm	SM 2510 B	06/10/03 19:51	imm	
Solids							
Total Dissolved Solids	210	20	mg/L	SM 2540C	06/13/03 13:50	tf	
Total Suspended Solids	ND	5	mg/L	SM 2540D	06/16/03 15:55	aeh	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.70	mg/L	SM 5310B	06/19/03 13:26	la	
General Physical							
Color	3.0	3.0	Color Units	SM 2120B	06/11/03 20:41	era	
Odor	ND	1.0	T.O.N.	SM 2150	06/11/03 20:41	era	
Turbidity	1.9	0.20	NTU	SM 2130 B	06/11/03 20:41	era	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	06/12/03 10:00	rrh	
General Inorganics							
Cyanide	ND	0.1	mg/L	SM 4500CN F	06/17/03 17:37	jb	NQChi
Nutrients							
Nitrite as N	ND	0.10	mg/L	SM 4500NO2 B	06/11/03 12:19	aeh	
Total Phosphorus	ND	0.05	mg/L	SM 4500P B E	06/11/03 17:15	jme	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	06/12/03 15:15	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Arsenic	ND	2.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Barium	ND	100	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Beryllium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Boron	ND	100	ug/L	EPA 200.7	06/12/03 15:16	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Total Chromium	9.7	1.0	ug/L	EPA 200.8	06/13/03 15:43	IEO	
Hexavalent Chromium	9.7	1.0	ug/L	EPA 218.6	06/10/03 23:28	kos	
Copper	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	

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Client Name: Layne-Christensen
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Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Iron	42	20	ug/L	EPA 200.7	06/12/03 15:16	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Manganese	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Mercury	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Nickel	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Selenium	ND	5.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Total Silica	23	0.50	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Silver	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Thallium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Zinc	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	06/14/03 03:11	nmm	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	06/14/03 03:11	nmm	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Atrazine	ND	0.50	ug/L	EPA 507	06/13/03 23:39	df	
Bromacil	ND	10	ug/L	EPA 507	06/13/03 23:39	df	
Butachlor	ND	0.38	ug/L	EPA 507	06/13/03 23:39	df	
Diazinon	ND	0.25	ug/L	EPA 507	06/13/03 23:39	df	
Dimethoate	ND	10	ug/L	EPA 507	06/13/03 23:39	df	
Diuron	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Metolachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Metribuzin	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Nitrogen-Phosphorus Pesticides by EPA 507							
Molinate	ND	0.90	ug/L	EPA 507	06/13/03 23:39	df	
Prometryn	ND	2.0	ug/L	EPA 507	06/13/03 23:39	df	
Simazine	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Thiobencarb	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Surrogate: 1,3-Dimethyl-2-Nitrobenzene	*134 %*	*70-130*		EPA 507	06/13/03 23:39	df	*NShi*
Organochlorine Pesticides and PCBs by EPA 508							
Aldrin	ND	0.075	ug/L	EPA 508	06/22/03 06:49	DTI	
Chlordane	ND	0.10	ug/L	EPA 508	06/22/03 06:49	DTI	
Chlorothalonil	ND	5.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Dieldrin	ND	0.020	ug/L	EPA 508	06/22/03 06:49	DTI	
Endrin	ND	0.10	ug/L	EPA 508	06/22/03 06:49	DTI	
Heptachlor	ND	0.010	ug/L	EPA 508	06/22/03 06:49	DTI	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	06/22/03 06:49	DTI	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	06/22/03 06:49	DTI	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Lindane	ND	0.20	ug/L	EPA 508	06/22/03 06:49	DTI	
Methoxychlor	ND	10	ug/L	EPA 508	06/22/03 06:49	DTI	
PCB'S (as DCB)	ND	1.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Propachlor	ND	0.50	ug/L	EPA 508	06/22/03 06:49	DTI	
Toxaphene	ND	1.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Surrogate: BZ-198	*101 %*	*70-130*		EPA 508	06/22/03 06:49	DTI	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	

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Client Name:	Layne-Christensen	Analytical Report:	Page 15 of 22
Contact:	Cris Hepburn	Project Name:	Layne Christensen-State Title
Address:	11001 Etiwanda Ave.	Project Number:	PO #43641
	Fontana, CA 92337	Work Order Number:	A3F0436
		Report Date:	27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Chlorinated Herbicides by EPA 515.3							
2,4-D	ND	10	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Bentazon	ND	2.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Dalapon	ND	10	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Dicamba	ND	1.5	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Dinoseb	ND	2.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Pichloram	ND	1.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Surrogate: DCAA	*107 %*	*70-130*		EPA 515.3	06/17/03 17:42	DTI	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,4-Dioxane	ND	35	ug/L	EPA 524.2	06/11/03 19:24	HG	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
2-Butanone(MEK)	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
2-Chloroethylvinyl Ether	ND	1.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Benzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bis(2-Chloroethyl)Ether	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromoform	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chloroform	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	

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Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Di-isopropyl ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Ethyl tert-Butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Naphthalene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Styrene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
tert-Amyl Methyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
tert-Butyl alcohol	ND	2.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Toluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	

*Reportable Detection Limit

E.S BABCOCK & SONS, INC.
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www.babcocklabs.com

Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	06/11/03 19:24	HG	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Surrogate: 1,2-Dichloroethane-d4	*91.4 %*	*50-150*		EPA 524.2	06/11/03 19:24	HG	
Surrogate: Bromofluorobenzene	*111 %*	*50-150*		EPA 524.2	06/11/03 19:24	HG	
Surrogate: Toluene-d8	*109 %*	*50-150*		EPA 524.2	06/11/03 19:24	HG	
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	06/17/03 01:09	DF	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	06/17/03 01:09	DF	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	06/17/03 01:09	DF	
Surrogate: Perylene-d12	*103 %*	*70-130*		EPA 525.2	06/17/03 01:09	DF	
Carbamates by EPA 531.1							
3-Hydroxycarbofuran	ND	3.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Aldicarb	ND	3.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Aldicarb sulfone	ND	4.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Aldicarb sulfoxide	ND	3.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Carbaryl	ND	5.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Carbofuran	ND	5.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	

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Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Carbamates by EPA 531.1							
Methomyl	ND	2.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Oxamyl	ND	20	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Glyphosate by EPA 547							
Glyphosate	ND	25	ug/L	EPA 547	06/18/03 22:19	DTI	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	06/12/03 00:33	DF	

*Reportable Detection Limit

ACCREDITED IN ACCORDANCE WITH nelac

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Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-03

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well (Dissolved)	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Arsenic	2.0	2.0	ug/L	EPA 200.8	06/12/03 15:17	ieo	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-04

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well (Dissolved)	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Arsenic	ND	2.0	ug/L	EPA 200.8	06/12/03 15:19	ieo	

*Reportable Detection Limit

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Client Name:	Layne-Christensen
Contact:	Cris Hepburn
Address:	11001 Etiwanda Ave.
	Fontana, CA 92337

Analytical Report:	
Project Name:	Layne Christensen-State Title
Project Number:	PO #43641
Work Order Number:	A3F0436
Report Date:	27-Jun-2003

Notes and Definitions

NQChi	QC was biased high, however analyte was not detected in sample.
NShi	The surrogate recovery for this sample was above laboratory acceptance limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (RDL)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

*Reportable Detection Limit

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E.S. Babcock & Sons, Inc.
6100 Quail Valley Court Riverside, CA 92507
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Chain of Custody & Sample Information Record

Client: Layne
Contact: Lou KoHN
Phone No. (909) 390-2833 322-2407

Project Name: LWDS
Project Location: Van Dam Farm

Turn Around Time: Routine 3-5 Days 48 Hours 24 Hours (Rushes Require Approval, Additional Charges May Apply)

Sampler Information
Name: Lou KoHN
Employer: Layne GeoScience
Signature: Lou KC

# of Containers & Preservatives: Cal. Title 22

Matrix: DW = Drinking Water; WW = Wastewater; GW = Groundwater; S = Soil; SG = Sludge; L = Liquid; M = Miscellaneous

Notes: will call w/ PO# 43641

ESB #	Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	MCAA	Total # of Containers	504, 507, 508	515, 534	525R, 531, 547	B, TP, Si, TSS	CrVIC	GMIO GP	TOC	Dissolved As	gross alpha	Dioxin	Diquat	asbestos	Notes
	Van Dam Station well	6/10	12:15	8	1	2		1		2	23	X	X	X	X	X	X	X	X	X	X	X	X	
	Van Dam FIELD well	6/10	11:15	10	1	2		1		2	23	X	X	X	X	X	X	X	X	X	X	X	X	
																								T-B Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
Lou KC	Lou KoHN Layne	6/10 1525	Karen Tracy	Karen Tracy / ESB

(For Lab Use Only) Sample Integrity Upon Receipt
Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature 17 ºC

JUN 10 2003
Lab No. Q3F0436

Page 1 of 1

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report: Page 1 of 22
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A3F0436-01	Van Dam Station Well	Water	06/10/03 12:15	Lou Kohn	06/10/03 15:25	Lou Kohn
A3F0436-02	Van Dam Field Well	Water	06/10/03 11:15	Lou Kohn	06/10/03 15:25	Lou Kohn
A3F0436-03	Van Dam Station Well (Dissolved)	Water	06/10/03 12:15	Lou Kohn	06/10/03 15:25	Lou Kohn
A3F0436-04	Van Dam Field Well (Dissolved)	Water	06/10/03 11:15	Lou Kohn	06/10/03 15:25	Lou Kohn

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☑ James K. Babcock
President

☐ Allison Mackenzie
Lab Manager

☐ Lawrence J. Chrystal
Lab Director

cc:

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Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	52	3.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Calcium	17	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Magnesium	2.0	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Sodium	36	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Potassium	1.8	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Total Cations	2.63	0.05	me/L	Calculation	06/12/03 15:14	lmt	
Anions							
Total Alkalinity	98	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Hydroxide	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Carbonate	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Bicarbonate	120	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Sulfate	12	0.50	mg/L	EPA 300.0	06/11/03 02:04	KOS	
Chloride	8.9	1.0	mg/L	EPA 300.0	06/11/03 02:04	KOS	
Nitrate as N	2.3	0.20	mg/L	EPA 300.0	06/11/03 02:04	KOS	
Fluoride	0.3	0.1	mg/L	SM 4500F C	06/12/03 21:59	imm	
Total Anions	2.64	0.05	me/L	Calculation	06/16/03 06:48	saf	
Aggregate Properties							
pH	8.1	1.0	pH Units	SM 4500H+ B	06/10/03 19:51	imm	
Specific Conductance	280	1.0	umhos/cm	SM 2510 B	06/10/03 19:51	imm	
Solids							
Total Dissolved Solids	180	10	mg/L	SM 2540C	06/13/03 13:50	tf	
Total Suspended Solids	ND	5	mg/L	SM 2540D	06/16/03 15:55	aeh	

*Reportable Detection Limit

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.70	mg/L	SM 5310B	06/19/03 13:16	la	
General Physical							
Color	3.0	3.0	Color Units	SM 2120B	06/11/03 20:41	era	
Odor	ND	1.0	T.O.N.	SM 2150	06/11/03 20:41	era	
Turbidity	1.5	0.20	NTU	SM 2130 B	06/11/03 20:41	era	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	06/12/03 10:00	rrh	
General Inorganics							
Cyanide	ND	0.1	mg/L	SM 4500CN F	06/17/03 17:37	jb	NQChi
Nutrients							
Nitrite as N	ND	0.10	mg/L	SM 4500NO2 B	06/11/03 12:19	aeh	
Total Phosphorus	ND	0.05	mg/L	SM 4500P B E	06/11/03 17:15	jme	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	06/12/03 15:14	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Arsenic	ND	2.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Barium	ND	100	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Beryllium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Boron	ND	100	ug/L	EPA 200.7	06/12/03 15:14	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Total Chromium	16	1.0	ug/L	EPA 200.8	06/13/03 15:41	IEO	
Hexavalent Chromium	16	1.0	ug/L	EPA 218.6	06/10/03 23:28	kos	
Copper	21	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	

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Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Iron	110	20	ug/L	EPA 200.7	06/12/03 15:14	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Manganese	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Mercury	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Nickel	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Selenium	ND	5.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Total Silica	18	0.50	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Silver	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Thallium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Zinc	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	06/14/03 02:45	nmm	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	06/14/03 02:45	nmm	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Atrazine	ND	0.50	ug/L	EPA 507	06/13/03 23:14	df	
Bromacil	ND	10	ug/L	EPA 507	06/13/03 23:14	df	
Butachlor	ND	0.38	ug/L	EPA 507	06/13/03 23:14	df	
Diazinon	ND	0.25	ug/L	EPA 507	06/13/03 23:14	df	
Dimethoate	ND	10	ug/L	EPA 507	06/13/03 23:14	df	
Diuron	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Metolachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Metribuzin	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	

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Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	**Result**	***RDL**	**Units**	**Method**	**Analysis Date**	**Analyst**	**Flag**
Nitrogen-Phosphorus Pesticides by EPA 507							
Molinate	ND	0.90	ug/L	EPA 507	06/13/03 23:14	df	
Prometryn	ND	2.0	ug/L	EPA 507	06/13/03 23:14	df	
Simazine	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Thiobencarb	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Surrogate: 1,3-Dimethyl-2-Nitrobenzene	*135 %*	*70-130*		EPA 507	06/13/03 23:14	df	*NShi*
Organochlorine Pesticides and PCBs by EPA 508							
Aldrin	ND	0.075	ug/L	EPA 508	06/22/03 06:13	DTI	
Chlordane	ND	0.10	ug/L	EPA 508	06/22/03 06:13	DTI	
Chlorothalonil	ND	5.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Dieldrin	ND	0.020	ug/L	EPA 508	06/22/03 06:13	DTI	
Endrin	ND	0.10	ug/L	EPA 508	06/22/03 06:13	DTI	
Heptachlor	ND	0.010	ug/L	EPA 508	06/22/03 06:13	DTI	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	06/22/03 06:13	DTI	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	06/22/03 06:13	DTI	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Lindane	ND	0.20	ug/L	EPA 508	06/22/03 06:13	DTI	
Methoxychlor	ND	10	ug/L	EPA 508	06/22/03 06:13	DTI	
PCB'S (as DCB)	ND	1.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Propachlor	ND	0.50	ug/L	EPA 508	06/22/03 06:13	DTI	
Toxaphene	ND	1.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Surrogate: BZ-198	*104 %*	*70-130*		EPA 508	06/22/03 06:13	DTI	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Chlorinated Herbicides by EPA 515.3							
2,4-D	ND	10	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Bentazon	ND	2.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Dalapon	ND	10	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Dicamba	ND	1.5	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Dinoseb	ND	2.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Pichloram	ND	1.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Surrogate: DCAA	*103 %*	*70-130*		EPA 515.3	06/17/03 17:10	DTI	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	

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Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,4-Dioxane	ND	35	ug/L	EPA 524.2	06/11/03 18:53	HG	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
2-Butanone(MEK)	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
2-Chloroethylvinyl Ether	ND	1.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Benzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bis(2-Chloroethyl)Ether	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromoform	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chloroform	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	

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Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Di-isopropyl ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Ethyl tert-Butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Naphthalene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Styrene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
tert-Amyl Methyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
tert-Butyl alcohol	ND	2.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Toluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	06/11/03 18:53	HG	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Surrogate: 1,2-Dichloroethane-d4	*86.8 %*	*50-150*		EPA 524.2	06/11/03 18:53	HG	
Surrogate: Bromofluorobenzene	*113 %*	*50-150*		EPA 524.2	06/11/03 18:53	HG	
Surrogate: Toluene-d8	*108 %*	*50-150*		EPA 524.2	06/11/03 18:53	HG	
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	06/17/03 00:43	DF	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	06/17/03 00:43	DF	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	06/17/03 00:43	DF	
Surrogate: Perylene-d12	*108 %*	*70-130*		EPA 525.2	06/17/03 00:43	DF	
Carbamates by EPA 531.1							
3-Hydroxycarbofuran	ND	3.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Aldicarb	ND	3.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Aldicarb sulfone	ND	4.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Aldicarb sulfoxide	ND	3.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Carbaryl	ND	5.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Carbofuran	ND	5.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	

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Work Order Number: A3F0436
Report Date: 27-Jun-2003

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A3F0436-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Carbamates by EPA 531.1							
Methomyl	ND	2.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Oxamyl	ND	20	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Glyphosate by EPA 547							
Glyphosate	ND	25	ug/L	EPA 547	06/18/03 21:57	DTI	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	06/12/03 00:09	DF	

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Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
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Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
A3F0436-01	Van Dam Station Well	Water	06/10/03 12:15	Lou Kohn	06/10/03 15:25	Lou Kohn
A3F0436-02	Van Dam Field Well	Water	06/10/03 11:15	Lou Kohn	06/10/03 15:25	Lou Kohn
A3F0436-03	Van Dam Station Well (Dissolved)	Water	06/10/03 12:15	Lou Kohn	06/10/03 15:25	Lou Kohn
A3F0436-04	Van Dam Field Well (Dissolved)	Water	06/10/03 11:15	Lou Kohn	06/10/03 15:25	Lou Kohn

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted. Babcock Laboratories and its officers and employees assume no responsibility and make no warranty, express or implied, for uses or interpretations made by any recipients, intended or unintended, of this report.

☑ James K. Babcock
President

☐ Allison Mackenzie
Lab Manager

☐ Lawrence J. Chrystal
Lab Director

cc:

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	52	3.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Calcium	17	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Magnesium	2.0	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Sodium	36	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Potassium	1.8	1.0	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Total Cations	2.63	0.05	me/L	Calculation	06/12/03 15:14	lmt	
Anions							
Total Alkalinity	98	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Hydroxide	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Carbonate	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Bicarbonate	120	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Sulfate	12	0.50	mg/L	EPA 300.0	06/11/03 02:04	KOS	
Chloride	8.9	1.0	mg/L	EPA 300.0	06/11/03 02:04	KOS	
Nitrate as N	2.3	0.20	mg/L	EPA 300.0	06/11/03 02:04	KOS	
Fluoride	0.3	0.1	mg/L	SM 4500F C	06/12/03 21:59	imm	
Total Anions	2.64	0.05	me/L	Calculation	06/16/03 06:48	saf	
Aggregate Properties							
pH	8.1	1.0	pH Units	SM 4500H+ B	06/10/03 19:51	imm	
Specific Conductance	280	1.0	umhos/cm	SM 2510 B	06/10/03 19:51	imm	
Solids							
Total Dissolved Solids	180	10	mg/L	SM 2540C	06/13/03 13:50	tf	
Total Suspended Solids	ND	5	mg/L	SM 2540D	06/16/03 15:55	aeh	

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Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.70	mg/L	SM 5310B	06/19/03 13:16	la	
General Physical							
Color	3.0	3.0	Color Units	SM 2120B	06/11/03 20:41	era	
Odor	ND	1.0	T.O.N.	SM 2150	06/11/03 20:41	era	
Turbidity	1.5	0.20	NTU	SM 2130 B	06/11/03 20:41	era	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	06/12/03 10:00	rrh	
General Inorganics							
Cyanide	ND	0.1	mg/L	SM 4500CN F	06/17/03 17:37	jb	NQChi
Nutrients							
Nitrite as N	ND	0.10	mg/L	SM 4500NO2 B	06/11/03 12:19	aeh	
Total Phosphorus	ND	0.05	mg/L	SM 4500P B E	06/11/03 17:15	jme	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	06/12/03 15:14	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Arsenic	ND	2.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Barium	ND	100	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Beryllium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Boron	ND	100	ug/L	EPA 200.7	06/12/03 15:14	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Total Chromium	16	1.0	ug/L	EPA 200.8	06/13/03 15:41	IEO	
Hexavalent Chromium	16	1.0	ug/L	EPA 218.6	06/10/03 23:28	kos	
Copper	21	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Iron	110	20	ug/L	EPA 200.7	06/12/03 15:14	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Manganese	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Mercury	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Nickel	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Selenium	ND	5.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Total Silica	18	0.50	mg/L	EPA 200.7	06/12/03 15:14	lmt	
Silver	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Thallium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:51	ieo	
Zinc	ND	10	ug/L	EPA 200.8	06/12/03 17:51	ieo	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	06/14/03 02:45	nmm	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	06/14/03 02:45	nmm	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Atrazine	ND	0.50	ug/L	EPA 507	06/13/03 23:14	df	
Bromacil	ND	10	ug/L	EPA 507	06/13/03 23:14	df	
Butachlor	ND	0.38	ug/L	EPA 507	06/13/03 23:14	df	
Diazinon	ND	0.25	ug/L	EPA 507	06/13/03 23:14	df	
Dimethoate	ND	10	ug/L	EPA 507	06/13/03 23:14	df	
Diuron	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Metolachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Metribuzin	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	

*Reportable Detection Limit

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Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Nitrogen-Phosphorus Pesticides by EPA 507							
Molinate	ND	0.90	ug/L	EPA 507	06/13/03 23:14	df	
Prometryn	ND	2.0	ug/L	EPA 507	06/13/03 23:14	df	
Simazine	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Thiobencarb	ND	1.0	ug/L	EPA 507	06/13/03 23:14	df	
Surrogate: 1,3-Dimethyl-2-Nitrobenzene	*135 %*	*70-130*		EPA 507	06/13/03 23:14	df	*NShi*
Organochlorine Pesticides and PCBs by EPA 508							
Aldrin	ND	0.075	ug/L	EPA 508	06/22/03 06:13	DTI	
Chlordane	ND	0.10	ug/L	EPA 508	06/22/03 06:13	DTI	
Chlorothalonil	ND	5.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Dieldrin	ND	0.020	ug/L	EPA 508	06/22/03 06:13	DTI	
Endrin	ND	0.10	ug/L	EPA 508	06/22/03 06:13	DTI	
Heptachlor	ND	0.010	ug/L	EPA 508	06/22/03 06:13	DTI	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	06/22/03 06:13	DTI	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	06/22/03 06:13	DTI	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Lindane	ND	0.20	ug/L	EPA 508	06/22/03 06:13	DTI	
Methoxychlor	ND	10	ug/L	EPA 508	06/22/03 06:13	DTI	
PCB'S (as DCB)	ND	1.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Propachlor	ND	0.50	ug/L	EPA 508	06/22/03 06:13	DTI	
Toxaphene	ND	1.0	ug/L	EPA 508	06/22/03 06:13	DTI	
Surrogate: BZ-198	*104 %*	*70-130*		EPA 508	06/22/03 06:13	DTI	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	

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Laboratory Reference Number
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Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Chlorinated Herbicides by EPA 515.3							
2,4-D	ND	10	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Bentazon	ND	2.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Dalapon	ND	10	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Dicamba	ND	1.5	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Dinoseb	ND	2.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Pichloram	ND	1.0	ug/L	EPA 515.3	06/17/03 17:10	DTI	
Surrogate: DCAA	*103 %*	*70-130*		EPA 515.3	06/17/03 17:10	DTI	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	

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ACCREDITED IN ACCORDANCE WITH nelac

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Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
1,4-Dioxane	ND	35	ug/L	EPA 524.2	06/11/03 18:53	HG	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
2-Butanone(MEK)	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
2-Chloroethylvinyl Ether	ND	1.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Benzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bis(2-Chloroethyl)Ether	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromoform	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Bromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chloroform	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Chloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	

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Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Di-isopropyl ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Ethyl tert-Butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Naphthalene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Styrene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
tert-Amyl Methyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
tert-Butyl alcohol	ND	2.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Toluene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	06/11/03 18:53	HG	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	06/11/03 18:53	HG	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	06/11/03 18:53	HG	
Surrogate: 1,2-Dichloroethane-d4	*86.8 %*	*50-150*		EPA 524.2	06/11/03 18:53	HG	
Surrogate: Bromofluorobenzene	*113 %*	*50-150*		EPA 524.2	06/11/03 18:53	HG	
Surrogate: Toluene-d8	*108 %*	*50-150*		EPA 524.2	06/11/03 18:53	HG	
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	06/17/03 00:43	DF	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	06/17/03 00:43	DF	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	06/17/03 00:43	DF	
Surrogate: Perylene-d12	*108 %*	*70-130*		EPA 525.2	06/17/03 00:43	DF	
Carbamates by EPA 531.1							
3-Hydroxycarbofuran	ND	3.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Aldicarb	ND	3.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Aldicarb sulfone	ND	4.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Aldicarb sulfoxide	ND	3.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Carbaryl	ND	5.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Carbofuran	ND	5.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	

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Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Carbamates by EPA 531.1							
Methomyl	ND	2.0	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Oxamyl	ND	20	ug/L	EPA 531.1	06/18/03 02:17	DTI	
Glyphosate by EPA 547							
Glyphosate	ND	25	ug/L	EPA 547	06/18/03 21:57	DTI	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	06/12/03 00:09	DF	

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Project Name: Layne Christensen-State Title
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Work Order Number: A3F0436
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Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Cations							
Total Hardness	85	3.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Calcium	28	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Magnesium	3.6	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Sodium	30	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Potassium	1.9	1.0	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Total Cations	3.05	0.05	me/L	Calculation	06/12/03 15:15	lmt	
Anions							
Total Alkalinity	120	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Hydroxide	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Carbonate	ND	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Bicarbonate	150	3.0	mg/L	SM 2320B	06/12/03 15:47	era	
Sulfate	13	0.50	mg/L	EPA 300.0	06/11/03 02:11	KOS	
Chloride	8.9	1.0	mg/L	EPA 300.0	06/11/03 02:11	KOS	
Nitrate as N	2.5	0.20	mg/L	EPA 300.0	06/11/03 02:11	KOS	
Fluoride	0.2	0.1	mg/L	SM 4500F C	06/12/03 21:59	imm	
Total Anions	3.11	0.05	me/L	Calculation	06/16/03 06:48	saf	
Aggregate Properties							
pH	7.9	1.0	pH Units	SM 4500H+ B	06/10/03 19:51	imm	
Specific Conductance	320	1.0	umhos/cm	SM 2510 B	06/10/03 19:51	imm	
Solids							
Total Dissolved Solids	210	20	mg/L	SM 2540C	06/13/03 13:50	tf	
Total Suspended Solids	ND	5	mg/L	SM 2540D	06/16/03 15:55	aeh	

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Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Aggregate Organic Compounds							
Total Organic Carbon	ND	0.70	mg/L	SM 5310B	06/19/03 13:26	la	
General Physical							
Color	3.0	3.0	Color Units	SM 2120B	06/11/03 20:41	era	
Odor	ND	1.0	T.O.N.	SM 2150	06/11/03 20:41	era	
Turbidity	1.9	0.20	NTU	SM 2130 B	06/11/03 20:41	era	
Surfactants							
MBAS	ND	0.05	mg/L	SM 5540C	06/12/03 10:00	rrh	
General Inorganics							
Cyanide	ND	0.1	mg/L	SM 4500CN F	06/17/03 17:37	jb	NQChi
Nutrients							
Nitrite as N	ND	0.10	mg/L	SM 4500NO2 B	06/11/03 12:19	aeh	
Total Phosphorus	ND	0.05	mg/L	SM 4500P B E	06/11/03 17:15	jme	
Metals and Metalloids							
Aluminum	ND	50	ug/L	EPA 200.7	06/12/03 15:15	lmt	
Antimony	ND	6.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Arsenic	ND	2.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Barium	ND	100	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Beryllium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Boron	ND	100	ug/L	EPA 200.7	06/12/03 15:16	lmt	
Cadmium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Total Chromium	9.7	1.0	ug/L	EPA 200.8	06/13/03 15:43	IEO	
Hexavalent Chromium	9.7	1.0	ug/L	EPA 218.6	06/10/03 23:28	kos	
Copper	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	

*Reportable Detection Limit

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www.babcocklabs.com

Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Iron	42	20	ug/L	EPA 200.7	06/12/03 15:16	lmt	
Lead	ND	5.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Manganese	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Mercury	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Nickel	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Selenium	ND	5.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Total Silica	23	0.50	mg/L	EPA 200.7	06/12/03 15:15	lmt	
Silver	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Thallium	ND	1.0	ug/L	EPA 200.8	06/12/03 17:56	ieo	
Zinc	ND	10	ug/L	EPA 200.8	06/12/03 17:56	ieo	
EDB and DBCP by EPA 504							
Ethylene dibromide	ND	0.020	ug/L	EPA 504.1	06/14/03 03:11	nmm	
Dibromochloropropane	ND	0.010	ug/L	EPA 504.1	06/14/03 03:11	nmm	
Nitrogen-Phosphorus Pesticides by EPA 507							
Alachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Atrazine	ND	0.50	ug/L	EPA 507	06/13/03 23:39	df	
Bromacil	ND	10	ug/L	EPA 507	06/13/03 23:39	df	
Butachlor	ND	0.38	ug/L	EPA 507	06/13/03 23:39	df	
Diazinon	ND	0.25	ug/L	EPA 507	06/13/03 23:39	df	
Dimethoate	ND	10	ug/L	EPA 507	06/13/03 23:39	df	
Diuron	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Metolachlor	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Metribuzin	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Nitrogen-Phosphorus Pesticides by EPA 507							
Molinate	ND	0.90	ug/L	EPA 507	06/13/03 23:39	df	
Prometryn	ND	2.0	ug/L	EPA 507	06/13/03 23:39	df	
Simazine	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Thiobencarb	ND	1.0	ug/L	EPA 507	06/13/03 23:39	df	
Surrogate: 1,3-Dimethyl-2-Nitrobenzene	*134 %*	*70-130*		EPA 507	06/13/03 23:39	df	*NShi*
Organochlorine Pesticides and PCBs by EPA 508							
Aldrin	ND	0.075	ug/L	EPA 508	06/22/03 06:49	DTI	
Chlordane	ND	0.10	ug/L	EPA 508	06/22/03 06:49	DTI	
Chlorothalonil	ND	5.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Dieldrin	ND	0.020	ug/L	EPA 508	06/22/03 06:49	DTI	
Endrin	ND	0.10	ug/L	EPA 508	06/22/03 06:49	DTI	
Heptachlor	ND	0.010	ug/L	EPA 508	06/22/03 06:49	DTI	
Heptachlor Epoxide	ND	0.010	ug/L	EPA 508	06/22/03 06:49	DTI	
Hexachlorobenzene	ND	0.50	ug/L	EPA 508	06/22/03 06:49	DTI	
Hexachlorocyclopentadiene	ND	1.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Lindane	ND	0.20	ug/L	EPA 508	06/22/03 06:49	DTI	
Methoxychlor	ND	10	ug/L	EPA 508	06/22/03 06:49	DTI	
PCB'S (as DCB)	ND	1.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Propachlor	ND	0.50	ug/L	EPA 508	06/22/03 06:49	DTI	
Toxaphene	ND	1.0	ug/L	EPA 508	06/22/03 06:49	DTI	
Surrogate: BZ-198	*101 %*	*70-130*		EPA 508	06/22/03 06:49	DTI	
Chlorinated Herbicides by EPA 515.3							
2,4,5-TP Silvex	ND	1.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Chlorinated Herbicides by EPA 515.3							
2,4-D	ND	10	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Bentazon	ND	2.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Dalapon	ND	10	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Dicamba	ND	1.5	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Dinoseb	ND	2.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Pentachlorophenol	ND	0.20	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Pichloram	ND	1.0	ug/L	EPA 515.3	06/17/03 17:42	DTI	
Surrogate: DCAA	*107 %*	*70-130*		EPA 515.3	06/17/03 17:42	DTI	
Volatile Organic Compounds by EPA 524.2							
1,1,1,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1,1-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1,2,2-Tetrachloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1,2-Trichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,1-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2,3-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2,4-Trichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2,4-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2-Dichloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,3,5-Trimethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
1,3-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,3-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,4-Dichlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
1,4-Dioxane	ND	35	ug/L	EPA 524.2	06/11/03 19:24	HG	
2,2-Dichloropropane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
2-Butanone(MEK)	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
2-Chloroethylvinyl Ether	ND	1.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
2-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
4-Chlorotoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
4-Methyl-2-Pentanone(MIBK)	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Benzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bis(2-Chloroethyl)Ether	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromodichloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromoform	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Bromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Carbon Tetrachloride	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chlorobenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chloroethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chloroform	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Chloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
cis-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
cis-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Dibromochloromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Dibromomethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Dichlorodifluoromethane	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Di-isopropyl ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Ethyl tert-Butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Ethylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Hexachlorobutadiene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Isopropylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Methyl tert butyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Methylene Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
n-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
n-Propylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Naphthalene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
p-Isopropyltoluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
sec-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Styrene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
tert-Amyl Methyl Ether	ND	3.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
tert-Butyl alcohol	ND	2.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
tert-Butylbenzene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Tetrachloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Toluene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
trans-1,2-Dichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	

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Client Name: Layne-Christensen
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Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Volatile Organic Compounds by EPA 524.2							
trans-1,3-Dichloropropene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Trichloroethene	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Trichlorofluoromethane	ND	5.0	ug/L	EPA 524.2	06/11/03 19:24	HG	
Trichlorotrifluoroethane	ND	10	ug/L	EPA 524.2	06/11/03 19:24	HG	
Vinyl Chloride	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Xylenes (m+p)	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Xylenes (ortho)	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Xylenes (Total)	ND	0.50	ug/L	EPA 524.2	06/11/03 19:24	HG	
Surrogate: 1,2-Dichloroethane-d4	*91.4 %*	*50-150*		EPA 524.2	06/11/03 19:24	HG	
Surrogate: Bromofluorobenzene	*111 %*	*50-150*		EPA 524.2	06/11/03 19:24	HG	
Surrogate: Toluene-d8	*109 %*	*50-150*		EPA 524.2	06/11/03 19:24	HG	
Semivolatile Organic Compounds by EPA 525.2							
Benzo(a)pyrene	ND	0.10	ug/L	EPA 525.2	06/17/03 01:09	DF	
DEH-Adipate	ND	5.0	ug/L	EPA 525.2	06/17/03 01:09	DF	
DEH-Phthalate	ND	3.0	ug/L	EPA 525.2	06/17/03 01:09	DF	
Surrogate: Perylene-d12	*103 %*	*70-130*		EPA 525.2	06/17/03 01:09	DF	
Carbamates by EPA 531.1							
3-Hydroxycarbofuran	ND	3.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Aldicarb	ND	3.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Aldicarb sulfone	ND	4.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Aldicarb sulfoxide	ND	3.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Carbaryl	ND	5.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Carbofuran	ND	5.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	

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Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Carbamates by EPA 531.1							
Methomyl	ND	2.0	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Oxamyl	ND	20	ug/L	EPA 531.1	06/18/03 03:02	DTI	
Glyphosate by EPA 547							
Glyphosate	ND	25	ug/L	EPA 547	06/18/03 22:19	DTI	
Endothall by EPA 548.1							
Endothall	ND	45	ug/L	EPA 548.1	06/12/03 00:33	DF	

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Fontana, CA 92337

Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-03

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Station Well (Dissolved)	Water	06/10/03 12:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Arsenic	2.0	2.0	ug/L	EPA 200.8	06/12/03 15:17	ieo	

*Reportable Detection Limit

ACCREDITED IN ACCORDANCE WITH nelac

E.S BABCOCK
& SONS, INC.
Established 1906

NELAP #02101CA ELAP#1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Analytical Report:
Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Laboratory Reference Number
A3F0436-04

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
Van Dam Field Well (Dissolved)	Water	06/10/03 11:15	06/10/03 15:25

Analyte(s)	Result	*RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids							
Arsenic	ND	2.0	ug/L	EPA 200.8	06/12/03 15:19	ieo	

*Reportable Detection Limit

ACCREDITED IN ACCORDANCE WITH nelac

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& SONS, INC.
Established 1906

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Client Name: Layne-Christensen
Contact: Cris Hepburn
Address: 11001 Etiwanda Ave.
Fontana, CA 92337

Project Name: Layne Christensen-State Title
Project Number: PO #43641
Work Order Number: A3F0436
Report Date: 27-Jun-2003

Notes and Definitions

NQChi	QC was biased high, however analyte was not detected in sample.
NShi	The surrogate recovery for this sample was above laboratory acceptance limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (RDL)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

*Reportable Detection Limit

E.S. BABCOCK & SONS, INC.
E.S. Babcock & Sons, Inc.
6100 Quail Valley Court Riverside. CA 92507
(909) 653-3351 • FAX (909) 653-1662

Chain of Custody & Sample Information Record

Client: Layne
Contact: Lou KoHN
Phone No. (909) 390-2833 322-2407

Project Name: LWDS
Project Location: Van Dam Farm

Turn Around Time: Routine 3-5 Days 48 Hours 24 Hours (Rushes Require Approval, Additional Charges May Apply)

Sampler Information
Name: Lou KoHN
Employer: Layne GeoScience
Signature: Lou K

Matrix: DW = Drinking Water; WW = Wastewater; GW = Groundwater; S = Soil; SG = Sludge; L = Liquid; M = Miscellaneous

Notes: will call w/ PO# 43641

# of Containers & Preservatives: Cal. Title 22

ESB #	Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	MCAA	Total # of Containers	504, 507, 508	515, 524	525, 531, 547	B, TP, Si, TSS	Cr(VI)	GMIO GP	TOC	Dissolved As	Gross alpha	Dioxin	Diquat	asbestos	Notes
	Van Dam Station well	6/10	12:15	18	1	2		1		2	23	X	X	X	X	X	X	X	X	X	X	X	X	
	Van Dam FiELD well	6/10	11:15	18	1	2		1		2	23	X	X	X	X	X	X	X	X	X	X	V	X	
																								T-B Rec'd

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
Lou K	Lou KoHN Layne	6/10 1525	Karen Tracy	Karen Tracy / ESB

(For Lab Use Only) Sample Integrity Upon Receipt
Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature 17 °C

JUN 1 0 2003
Lab No. 03F0436

Page 1 of 1

LABORATORY ANALYTICAL DATA SHEETS

Del Mar Analytical

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LABORATORY REPORT

Prepared For: Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project: Antelope Valley

Sampled: 07/25/03
Received: 07/25/03
Issued: 08/18/03

CA ELAP #1169

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical.
This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

SUBCONTRACTED: Refer to the last page for specific subcontract laboratory information included in this report.

LABORATORY ID	CLIENT ID	MATRIX
CMG0155-01	Van Dam #3 438'	Water

Del Mar Analytical, Colton
Jeanne Shoulder
Project Manager

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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: Antelope Valley Report Number: CMG0155	Sampled: 07/25/03 Received: 07/25/03

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: ug/l								
Aluminum	EPA 200.7	3G28059	50	**24000**	1	7/28/2003	8/4/2003	
Antimony	EPA 200.8	3H11042	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8	3H11042	1.0	**5.4**	1	8/11/2003	8/11/2003	
Barium	EPA 200.7	3G28059	10	**180**	1	7/28/2003	7/29/2003	
Beryllium	EPA 200.8	3H11042	0.50	**0.67**	1	8/11/2003	8/11/2003	
Boron	EPA 200.7	3G28059	50	ND	1	7/28/2003	7/29/2003	
Cadmium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7	3G28059	100	**31000**	1	7/28/2003	7/29/2003	
Chromium	EPA 200.7	3G28059	5.0	**57**	1	7/28/2003	7/29/2003	
Copper	EPA 200.7	3G28059	10	**44**	1	7/28/2003	7/29/2003	
Iron	EPA 200.7	3G28059	40	**35000**	1	7/28/2003	7/29/2003	
Lead	EPA 200.7	3G28059	5.0	**9.3**	1	7/28/2003	7/29/2003	
Magnesium	EPA 200.7	3G28059	20	**13000**	1	7/28/2003	8/1/2003	
Manganese	EPA 200.7	3G28059	20	**620**	1	7/28/2003	7/28/2003	
Mercury	EPA 245.1	3G30061	0.20	**1.3**	1	7/30/2003	7/30/2003	
Nickel	EPA 200.7	3G28059	10	**43**	1	7/28/2003	7/29/2003	
Potassium	EPA 200.7	3G28059	500	**5100**	1	7/28/2003	7/29/2003	
Selenium	EPA 200.7	3G28059	5.0	ND	1	7/28/2003	7/29/2003	
Silicon	EPA 200.7	3G28059	51	**60000**	1	7/28/2003	7/29/2003	
Silver	EPA 200.7	3G28059	10	ND	1	7/28/2003	7/29/2003	
Sodium	EPA 200.7	3G28059	500	**36000**	1	7/28/2003	7/29/2003	
Thallium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7	3G28059	20	**67**	1	7/28/2003	7/29/2003	

Del Mar Analytical, Colton
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Project Manager

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

DISSOLVED METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: ug/l								
Aluminum	EPA 200.7-Diss	3H14053	50	ND	1	8/14/2003	8/15/2003	
Antimony	EPA 200.8-Diss	3H11045	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8-Diss	3H11045	1.0	ND	1	8/11/2003	8/11/2003	
Barium	EPA 200.7-Diss	3H14053	10	**36**	1	8/14/2003	8/15/2003	
Beryllium	EPA 200.8-Diss	3H11045	0.50	ND	1	8/11/2003	8/11/2003	
Boron	EPA 200.7-Diss	3H14053	50	ND	1	8/14/2003	8/15/2003	
Cadmium	EPA 200.8-Diss	3H11045	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7-Diss	3H14053	100	**19000**	1	8/14/2003	8/15/2003	
Chromium	EPA 200.7-Diss	3H14053	5.0	ND	1	8/14/2003	8/15/2003	
Copper	EPA 200.7-Diss	3H14053	10	ND	1	8/14/2003	8/15/2003	
Iron	EPA 200.7-Diss	3H14053	40	ND	1	8/14/2003	8/15/2003	
Lead	EPA 200.7-Diss	3H14053	5.0	ND	1	8/14/2003	8/15/2003	
Magnesium	EPA 200.7-Diss	3H14053	20	**2300**	1	8/14/2003	8/15/2003	
Manganese	EPA 200.7-Diss	3H14053	20	**57**	1	8/14/2003	8/15/2003	
Mercury	EPA 245.1-Diss	3H13076	0.20	ND	1	8/13/2003	8/13/2003	
Nickel	EPA 200.7-Diss	3H14053	10	ND	1	8/14/2003	8/15/2003	
Potassium	EPA 200.7-Diss	3H14053	500	**2200**	1	8/14/2003	8/15/2003	
Selenium	EPA 200.7-Diss	3H14053	5.0	ND	1	8/14/2003	8/15/2003	
Silicon	EPA 200.7-Diss	3H14053	51	**8700**	1	8/14/2003	8/15/2003	
Silver	EPA 200.7-Diss	3H14053	10	ND	1	8/14/2003	8/15/2003	
Sodium	EPA 200.7-Diss	3H14053	500	**34000**	1	8/14/2003	8/15/2003	
Thallium	EPA 200.8-Diss	3H11045	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7-Diss	3H14053	20	ND	1	8/14/2003	8/15/2003	

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: °C								
Temperature	EPA 170.1	3H06051	NA	**28**	1	7/24/2003	7/24/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: Color Units								
Color	SM2120B	3G26035	1.0	**19**	1	7/26/2003	7/26/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: mg/l								
Alkalinity as CaCO3	SM2320B	3G31105	2.0	**110**	1	7/31/2003	7/31/2003	
Bicarbonate Alkalinity as CaCO3	SM2320B	3G31105	2.0	**100**	1	7/31/2003	7/31/2003	
Carbonate Alkalinity as CaCO3	SM2320B	3G31105	2.0	**8.0**	1	7/31/2003	7/31/2003	
Hydroxide Alkalinity as CaCO3	SM2320B	3G31105	2.0	ND	1	7/31/2003	7/31/2003	
Ammonia-N	EPA 350.3	3G28048	0.50	ND	1	7/28/2003	7/28/2003	
Bromide	EPA 300.0	3G25037	0.50	ND	1	7/25/2003	7/25/2003	
Chloride	EPA 300.0	3G25037	0.50	**8.2**	1	7/25/2003	7/25/2003	
Chromium VI	EPA 218.6	3G25073	0.0010	ND	1	7/25/2003	7/25/2003	
Total Cyanide	SM4500-CN-C,E	3G28061	0.025	ND	1	7/28/2003	7/28/2003	
Fluoride	EPA 300.0	3G28039	0.50	ND	1	7/28/2003	7/28/2003	
Hardness (as CaCO3)	SM2340B	3G28059	1.0	**130**	1	7/28/2003	7/29/2003	
Nitrate-NO3	EPA 300.0	3G25037	0.50	**9.0**	1	7/25/2003	7/25/2003	
Nitrite-N	EPA 300.0	3G25037	0.15	ND	1	7/25/2003	7/25/2003	
Nitrate/Nitrite-N	EPA 300.0	3G25037	0.15	**2.0**	1	7/25/2003	7/25/2003	
Phosphorus	EPA 365.3	3G30049	0.050	**0.15**	1	7/30/2003	7/30/2003	
Sulfate	EPA 300.0	3G25037	0.50	**14**	1	7/25/2003	7/25/2003	
Surfactants (MBAS)	SM5540-C	3G25064	0.40	ND	4	7/25/2003	7/25/2003	M2, RL-1
Total Dissolved Solids	EPA 160.1	3G28080	10	**200**	1	7/28/2003	7/28/2003	
Total Organic Carbon	EPA 415.1	3G30056	1.0	**2.1**	1	7/30/2003	7/30/2003	
Total Suspended Solids	EPA 160.2	3G28060	10	**460**	1	7/28/2003	7/28/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: NTU								
Turbidity	EPA 180.1	3G26036	50	**990**	50	7/26/2003	7/26/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: pH Units								
pH	EPA 150.1	3G25077	NA	**8.05**	1	7/25/2003	7/25/2003	
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: T.O.N.								
Odor	SM2150B	3G25079	1.0	ND	1	7/25/2003	7/25/2003	H3

Del Mar Analytical, Colton
Jeanne Shoulder
Project Manager

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: umhos/cm								
Specific Conductance	EPA 120.1	3G28079	1.0	**260**	1	7/28/2003	7/28/2003	

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

LANGLIER SATURATION INDEX

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMG0155-01 (Van Dam #3 438' - Water)				**Sampled: 07/25/03**				
Reporting Units: SI Units								
Langlier Index	SM 2330B	3H06052	0.010	**0.37**	1	8/6/2003	8/6/2003	

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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: Antelope Valley Report Number: CMG0155	Sampled: 07/25/03 Received: 07/25/03

SHORT HOLD TIME DETAIL REPORT

	Hold Time (in days)	Date/Time Sampled	Date/Time Received	Date/Time Extracted	Date/Time Analyzed
Sample ID: Van Dam #3 438' (CMG0155-01) - Water					
EPA 150.1	1	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:15	07/25/2003 21:20
EPA 170.1	1	07/25/2003 13:25	07/25/2003 16:00	07/24/2003 13:25	07/24/2003 13:25
EPA 180.1	2	07/25/2003 13:25	07/25/2003 16:00	07/26/2003 12:00	07/26/2003 13:00
EPA 218.6	1	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 18:40	07/25/2003 19:25
EPA 300.0	2	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:00	07/25/2003 20:51
SM2120B	2	07/25/2003 13:25	07/25/2003 16:00	07/26/2003 12:00	07/26/2003 13:00
SM2150B	1	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:00	07/25/2003 20:30
SM5540-C	2	07/25/2003 13:25	07/25/2003 16:00	07/25/2003 20:00	07/25/2003 21:00

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Project Manager

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28059 Extracted: 07/28/03										
Blank Analyzed: 08/04/03 (3G28059-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							
LCS Analyzed: 08/04/03 (3G28059-BS1)										
Aluminum	540	50	ug/l	500		108	85-115			
Barium	524	10	ug/l	500		105	85-115			
Boron	513	50	ug/l	500		103	85-115			
Calcium	2820	100	ug/l	2500		113	85-115			
Chromium	524	5.0	ug/l	500		105	85-115			
Copper	486	10	ug/l	500		97	85-115			
Iron	526	40	ug/l	500		105	85-115			
Lead	521	5.0	ug/l	500		104	85-115			
Magnesium	2840	20	ug/l	2500		114	85-115			
Manganese	513	20	ug/l	500		103	85-115			
Nickel	508	10	ug/l	500		102	85-115			
Potassium	5160	500	ug/l	5000		103	85-115			
Selenium	509	5.0	ug/l	500		102	85-115			
Silicon	2570	51	ug/l	2500		103	85-115			
Silver	258	10	ug/l	250		103	85-115			
Sodium	2580	500	ug/l	2500		103	85-115			

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28059 Extracted: 07/28/03										
LCS Analyzed: 07/29/03 (3G28059-BS1)										
Zinc	504	20	ug/l	500		101	85-115			
Matrix Spike Analyzed: 08/04/03 (3G28059-MS1)					**Source: IMG1369-01**					
Aluminum	593	50	ug/l	500	ND	119	70-130			
Barium	527	10	ug/l	500	26	100	70-130			
Boron	674	50	ug/l	500	160	103	70-130			
Calcium	46600	100	ug/l	2500	44000	104	70-130			
Chromium	509	5.0	ug/l	500	ND	102	70-130			
Copper	486	10	ug/l	500	4.6	96	70-130			
Iron	527	40	ug/l	500	18	102	70-130			
Lead	505	5.0	ug/l	500	ND	101	70-130			
Magnesium	13400	20	ug/l	2500	10000	136	70-130			*M1*
Manganese	497	20	ug/l	500	ND	99	70-130			
Nickel	473	10	ug/l	500	ND	95	70-130			
Potassium	8600	500	ug/l	5000	3200	108	70-130			
Selenium	506	5.0	ug/l	500	4.8	100	70-130			
Silicon	16000	51	ug/l	2500	14000	80	70-130			
Silver	249	10	ug/l	250	ND	100	70-130			
Sodium	47400	500	ug/l	2500	44000	136	70-130			*M-HA*
Zinc	505	20	ug/l	500	9.4	99	70-130			
Matrix Spike Dup Analyzed: 08/04/03 (3G28059-MSD1)					**Source: IMG1369-01**					
Aluminum	582	50	ug/l	500	ND	116	70-130	2	20	
Barium	531	10	ug/l	500	26	101	70-130	1	20	
Boron	682	50	ug/l	500	160	104	70-130	1	20	
Calcium	46700	100	ug/l	2500	44000	108	70-130	0	20	
Chromium	513	5.0	ug/l	500	ND	103	70-130	1	20	
Copper	490	10	ug/l	500	4.6	97	70-130	1	20	
Iron	531	40	ug/l	500	18	103	70-130	1	20	
Lead	510	5.0	ug/l	500	ND	102	70-130	1	20	
Magnesium	13300	20	ug/l	2500	10000	132	70-130	1	20	*M1*
Manganese	503	20	ug/l	500	ND	101	70-130	1	20	
Nickel	477	10	ug/l	500	ND	95	70-130	1	20	
Potassium	8720	500	ug/l	5000	3200	110	70-130	1	20	
Selenium	519	5.0	ug/l	500	4.8	103	70-130	3	20	
Silicon	16100	51	ug/l	2500	14000	84	70-130	1	20	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28059 Extracted: 07/28/03										
Matrix Spike Dup Analyzed: 07/29/03 (3G28059-MSD1)					**Source: IMG1369-01**					
Silver	250	10	ug/l	250	ND	100	70-130	0	20	
Sodium	47600	500	ug/l	2500	44000	144	70-130	0	20	*M-HA*
Zinc	510	20	ug/l	500	9.4	100	70-130	1	20	
Batch: 3G30061 Extracted: 07/30/03										
Blank Analyzed: 07/30/03 (3G30061-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 07/30/03 (3G30061-BS1)										
Mercury	8.55	0.20	ug/l	8.00		107	85-115			
Matrix Spike Analyzed: 07/30/03 (3G30061-MS1)					**Source: IMG1501-02**					
Mercury	7.39	0.20	ug/l	8.00	ND	92	70-130			
Matrix Spike Dup Analyzed: 07/30/03 (3G30061-MSD1)					**Source: IMG1501-02**					
Mercury	7.28	0.20	ug/l	8.00	ND	91	70-130	1	20	
Batch: 3H11042 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11042-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11042 Extracted: 08/11/03										
LCS Analyzed: 08/11/03 (3H11042-BS1)										
Antimony	90.5	2.0	ug/l	80.0		113	85-115			
Arsenic	88.5	1.0	ug/l	80.0		111	85-115			
Beryllium	83.0	0.50	ug/l	80.0		104	85-115			
Cadmium	85.1	1.0	ug/l	80.0		106	85-115			
Thallium	84.2	1.0	ug/l	80.0		105	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11042-MS1)					**Source: IMH0411-01**					
Antimony	82.3	2.0	ug/l	80.0	0.49	102	70-130			
Arsenic	119	1.0	ug/l	80.0	34	106	70-130			
Beryllium	74.8	0.50	ug/l	80.0	ND	94	70-130			
Cadmium	71.5	1.0	ug/l	80.0	0.092	89	70-130			
Thallium	79.0	1.0	ug/l	80.0	ND	99	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11042-MSD1)					**Source: IMH0411-01**					
Antimony	82.2	2.0	ug/l	80.0	0.49	102	70-130	0	20	
Arsenic	119	1.0	ug/l	80.0	34	106	70-130	0	20	
Beryllium	76.2	0.50	ug/l	80.0	ND	95	70-130	2	20	
Cadmium	71.4	1.0	ug/l	80.0	0.092	89	70-130	0	20	
Thallium	79.2	1.0	ug/l	80.0	ND	99	70-130	0	20	

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DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11045 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11045-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							
LCS Analyzed: 08/11/03 (3H11045-BS1)										
Antimony	88.9	2.0	ug/l	80.0		111	85-115			
Arsenic	85.3	1.0	ug/l	80.0		107	85-115			
Beryllium	88.1	0.50	ug/l	80.0		110	85-115			
Cadmium	84.7	1.0	ug/l	80.0		106	85-115			
Thallium	75.6	1.0	ug/l	80.0		94	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11045-MS1)					**Source: CMG0155-01**					
Antimony	88.4	2.0	ug/l	80.0	0.22	110	70-130			
Arsenic	87.0	1.0	ug/l	80.0	0.77	108	70-130			
Beryllium	87.0	0.50	ug/l	80.0	ND	109	70-130			
Cadmium	81.2	1.0	ug/l	80.0	ND	102	70-130			
Thallium	80.0	1.0	ug/l	80.0	ND	100	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11045-MSD1)					**Source: CMG0155-01**					
Antimony	87.8	2.0	ug/l	80.0	0.22	109	70-130	1	20	
Arsenic	86.7	1.0	ug/l	80.0	0.77	107	70-130	0	20	
Beryllium	86.6	0.50	ug/l	80.0	ND	108	70-130	1	20	
Cadmium	81.0	1.0	ug/l	80.0	ND	101	70-130	0	20	
Thallium	81.1	1.0	ug/l	80.0	ND	101	70-130	1	20	

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DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H13076 Extracted: 08/13/03										
Blank Analyzed: 08/13/03 (3H13076-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 08/13/03 (3H13076-BS1)										
Mercury	8.25	0.20	ug/l	8.00		103	85-115			
Matrix Spike Analyzed: 08/13/03 (3H13076-MS1)					**Source: IMH0074-01**					
Mercury	7.75	0.20	ug/l	8.00	ND	97	70-130			
Matrix Spike Dup Analyzed: 08/13/03 (3H13076-MSD1)					**Source: IMH0074-01**					
Mercury	7.80	0.20	ug/l	8.00	ND	98	70-130	1	20	
Batch: 3H14053 Extracted: 08/14/03										
Blank Analyzed: 08/15/03 (3H14053-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14053 Extracted: 08/14/03										
LCS Analyzed: 08/15/03 (3H14053-BS1)										
Aluminum	498	50	ug/l	500		100	85-115			
Barium	533	10	ug/l	500		107	85-115			
Boron	490	50	ug/l	500		98	85-115			
Calcium	2500	100	ug/l	2500		100	85-115			
Chromium	502	5.0	ug/l	500		100	85-115			
Copper	500	10	ug/l	500		100	85-115			
Iron	510	40	ug/l	500		102	85-115			
Lead	499	5.0	ug/l	500		100	85-115			
Magnesium	2520	20	ug/l	2500		101	85-115			
Manganese	534	20	ug/l	500		107	85-115			
Nickel	511	10	ug/l	500		102	85-115			
Potassium	5150	500	ug/l	5000		103	85-115			
Selenium	505	5.0	ug/l	500		101	85-115			
Silicon	2710	51	ug/l	2500		108	85-115			
Silver	254	10	ug/l	250		102	85-115			
Sodium	2590	500	ug/l	2500		104	85-115			
Zinc	494	20	ug/l	500		99	85-115			
Matrix Spike Analyzed: 08/15/03 (3H14053-MS1)					**Source: CMG0155-01**					
Aluminum	538	50	ug/l	500	ND	108	70-130			
Barium	568	10	ug/l	500	36	106	70-130			
Boron	525	50	ug/l	500	27	100	70-130			
Calcium	21100	100	ug/l	2500	19000	84	70-130			
Chromium	504	5.0	ug/l	500	ND	101	70-130			
Copper	536	10	ug/l	500	4.0	106	70-130			
Iron	512	40	ug/l	500	ND	102	70-130			
Lead	509	5.0	ug/l	500	ND	102	70-130			
Magnesium	4740	20	ug/l	2500	2300	98	70-130			
Manganese	593	20	ug/l	500	57	107	70-130			
Nickel	516	10	ug/l	500	ND	103	70-130			
Potassium	7590	500	ug/l	5000	2200	108	70-130			
Selenium	511	5.0	ug/l	500	ND	102	70-130			
Silicon	11200	51	ug/l	2500	8700	100	70-130			
Silver	258	10	ug/l	250	ND	103	70-130			
Sodium	36100	500	ug/l	2500	34000	84	70-130			

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14053 Extracted: 08/14/03										
Matrix Spike Analyzed: 08/15/03 (3H14053-MS1)					**Source: CMG0155-01**					
Zinc	507	20	ug/l	500	ND	101	70-130			
Matrix Spike Dup Analyzed: 08/15/03 (3H14053-MSD1)					**Source: CMG0155-01**					
Aluminum	517	50	ug/l	500	ND	103	70-130	4	20	
Barium	566	10	ug/l	500	36	106	70-130	0	20	
Boron	522	50	ug/l	500	27	99	70-130	1	20	
Calcium	21100	100	ug/l	2500	19000	84	70-130	0	20	
Chromium	501	5.0	ug/l	500	ND	100	70-130	1	20	
Copper	540	10	ug/l	500	4.0	107	70-130	1	20	
Iron	513	40	ug/l	500	ND	103	70-130	0	20	
Lead	507	5.0	ug/l	500	ND	101	70-130	0	20	
Magnesium	4730	20	ug/l	2500	2300	97	70-130	0	20	
Manganese	574	20	ug/l	500	57	103	70-130	3	20	
Nickel	515	10	ug/l	500	ND	103	70-130	0	20	
Potassium	7600	500	ug/l	5000	2200	108	70-130	0	20	
Selenium	516	5.0	ug/l	500	ND	103	70-130	1	20	
Silicon	11100	51	ug/l	2500	8700	96	70-130	1	20	
Silver	256	10	ug/l	250	ND	102	70-130	1	20	
Sodium	36000	500	ug/l	2500	34000	80	70-130	0	20	
Zinc	505	20	ug/l	500	ND	101	70-130	0	20	

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INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G25037 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25037-BLK1)										
Bromide	ND	0.50	mg/l							
Chloride	ND	0.50	mg/l							
Nitrate-NO3	ND	0.50	mg/l							
Nitrite-N	ND	0.15	mg/l							
Nitrate/Nitrite-N	ND	0.15	mg/l							
Sulfate	ND	0.50	mg/l							
LCS Analyzed: 07/25/03 (3G25037-BS1)										
Bromide	5.00	0.50	mg/l	5.00		100	90-110			
Chloride	4.84	0.50	mg/l	5.00		97	90-110			*M3*
Nitrate-NO3	5.00	0.50	mg/l	5.00		100	90-110			
Nitrite-N	1.54	0.15	mg/l	1.52		101	90-110			
Sulfate	9.52	0.50	mg/l	10.0		95	90-110			
Matrix Spike Analyzed: 07/25/03 (3G25037-MS1)					**Source: IMG1324-12**					
Bromide	6.35	0.50	mg/l	5.00	1.2	103	80-120			
Nitrate-NO3	5.01	0.50	mg/l	5.00	ND	100	80-120			
Nitrite-N	2.01	0.15	mg/l	1.52	ND	132	80-120			*M1*
Sulfate	10.6	0.50	mg/l	10.0	1.5	91	80-120			
Matrix Spike Dup Analyzed: 07/25/03 (3G25037-MSD1)					**Source: IMG1324-12**					
Bromide	6.37	0.50	mg/l	5.00	1.2	103	80-120	0	20	
Nitrate-NO3	5.19	0.50	mg/l	5.00	ND	104	80-120	4	20	
Nitrite-N	2.01	0.15	mg/l	1.52	ND	132	80-120	0	20	*M1*
Sulfate	10.8	0.50	mg/l	10.0	1.5	93	80-120	2	20	
Batch: 3G25064 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25064-BLK1)										
Surfactants (MBAS)	ND	0.10	mg/l							

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G25064 Extracted: 07/25/03										
LCS Analyzed: 07/25/03 (3G25064-BS1)										
Surfactants (MBAS)	0.230	0.10	mg/l	0.250		92	90-110			
Matrix Spike Analyzed: 07/25/03 (3G25064-MS1)					**Source: CMG0155-01**					
Surfactants (MBAS)	0.195	0.40	mg/l	1.00	0.11	8	50-125			*M2*
Matrix Spike Dup Analyzed: 07/25/03 (3G25064-MSD1)					**Source: CMG0155-01**					
Surfactants (MBAS)	0.203	0.40	mg/l	1.00	0.11	9	50-125	4	20	*M2*
Batch: 3G25073 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25073-BLK1)										
Chromium VI	ND	0.0010	mg/l							
LCS Analyzed: 07/25/03 (3G25073-BS1)										
Chromium VI	0.0525	0.0010	mg/l	0.0500		105	90-110			
Matrix Spike Analyzed: 07/25/03 (3G25073-MS1)					**Source: CMG0155-01**					
Chromium VI	0.0532	0.0010	mg/l	0.0500	ND	106	70-130			
Matrix Spike Dup Analyzed: 07/25/03 (3G25073-MSD1)					**Source: CMG0155-01**					
Chromium VI	0.0534	0.0010	mg/l	0.0500	ND	107	70-130	0	15	
Batch: 3G25077 Extracted: 07/25/03										
Duplicate Analyzed: 07/25/03 (3G25077-DUP1)					**Source: IMG1309-04**					
pH	7.75	NA	pH Units		7.76			0	5	

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G25079 Extracted: 07/25/03										
Blank Analyzed: 07/25/03 (3G25079-BLK1)										
Odor	ND	1.0	T.O.N.							
Batch: 3G26035 Extracted: 07/26/03										
Duplicate Analyzed: 07/26/03 (3G26035-DUP1)					**Source: CMG0155-01**					
Color	19.0	1.0	Color Units		19			0	20	
Batch: 3G26036 Extracted: 07/26/03										
Blank Analyzed: 07/26/03 (3G26036-BLK1)										
Turbidity	ND	1.0	NTU							
Duplicate Analyzed: 07/26/03 (3G26036-DUP1)					**Source: CMG0155-01**					
Turbidity	1000	50	NTU		990			1	20	
Batch: 3G28039 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28039-BLK1)										
Fluoride	ND	0.50	mg/l							
LCS Analyzed: 07/28/03 (3G28039-BS1)										
Fluoride	4.70	0.50	mg/l	5.00		94	90-110			
Matrix Spike Analyzed: 07/28/03 (3G28039-MS1)					**Source: IMG1251-01**					
Fluoride	5.25	2.5	mg/l	5.00	1.4	77	80-120			*M2*

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Attention: Tony Morgan

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Report Number: CMG0155

Sampled: 07/25/03
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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28039 Extracted: 07/28/03										
Matrix Spike Dup Analyzed: 07/28/03 (3G28039-MSD1)					**Source: IMG1251-01**					
Fluoride	4.60	2.5	mg/l	5.00	1.4	64	80-120	13	20	*M2*
Batch: 3G28048 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28048-BLK1)										
Ammonia-N	ND	0.50	mg/l							
LCS Analyzed: 07/28/03 (3G28048-BS1)										
Ammonia-N	1.06	0.50	mg/l	1.00		106	85-115			
Matrix Spike Analyzed: 07/28/03 (3G28048-MS1)					**Source: IMG1139-01**					
Ammonia-N	2.00	0.50	mg/l	2.00	0.11	94	75-125			
Matrix Spike Dup Analyzed: 07/28/03 (3G28048-MSD1)					**Source: IMG1139-01**					
Ammonia-N	2.08	0.50	mg/l	2.00	0.11	98	75-125	4	15	
Batch: 3G28059 Extracted: 07/28/03										
Blank Analyzed: 07/29/03 (3G28059-BLK1)										
Hardness (as CaCO3)	ND	1.0	mg/l							
Batch: 3G28060 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28060-BLK1)										
Total Suspended Solids	ND	10	mg/l							

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28060 Extracted: 07/28/03										
LCS Analyzed: 07/28/03 (3G28060-BS1)										
Total Suspended Solids	1000	10	mg/l	1000		100	85-115			
Duplicate Analyzed: 07/28/03 (3G28060-DUP1)					**Source: IMG1245-01**					
Total Suspended Solids	1340	10	mg/l		1300			3	5	
Batch: 3G28061 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28061-BLK1)										
Total Cyanide	ND	0.025	mg/l							
LCS Analyzed: 07/28/03 (3G28061-BS1)										
Total Cyanide	0.204	0.025	mg/l	0.200		102	90-110			
Matrix Spike Analyzed: 07/28/03 (3G28061-MS1)					**Source: IMG1253-01**					
Total Cyanide	0.194	0.025	mg/l	0.200	ND	97	70-115			
Matrix Spike Dup Analyzed: 07/28/03 (3G28061-MSD1)					**Source: IMG1253-01**					
Total Cyanide	0.192	0.025	mg/l	0.200	ND	96	70-115	1	15	
Batch: 3G28079 Extracted: 07/28/03										
Duplicate Analyzed: 07/28/03 (3G28079-DUP1)					**Source: IMG1345-01**					
Specific Conductance	880	1.0	umhos/cm		890			1	5	
Batch: 3G28080 Extracted: 07/28/03										
Blank Analyzed: 07/28/03 (3G28080-BLK1)										
Total Dissolved Solids	ND	10	mg/l							

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Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G28080 Extracted: 07/28/03										
Duplicate Analyzed: 07/28/03 (3G28080-DUP1)					**Source: IMG1248-01**					
Total Dissolved Solids	4400	10	mg/l		4400			0	20	
Reference Analyzed: 07/28/03 (3G28080-SRM1)										
Total Dissolved Solids	1020	10	mg/l	1000		102	90-110			
Batch: 3G30049 Extracted: 07/30/03										
Blank Analyzed: 07/30/03 (3G30049-BLK1)										
Phosphorus	ND	0.050	mg/l							
LCS Analyzed: 07/30/03 (3G30049-BS1)										
Phosphorus	0.991	0.050	mg/l	1.00		99	80-120			
Matrix Spike Analyzed: 07/30/03 (3G30049-MS1)					**Source: IMG1448-02**					
Phosphorus	1.07	0.050	mg/l	1.00	0.11	96	65-130			
Matrix Spike Dup Analyzed: 07/30/03 (3G30049-MSD1)					**Source: IMG1448-02**					
Phosphorus	1.11	0.050	mg/l	1.00	0.11	100	65-130	4	15	
Batch: 3G30056 Extracted: 07/30/03										
Blank Analyzed: 07/30/03 (3G30056-BLK1)										
Total Organic Carbon	ND	1.0	mg/l							
LCS Analyzed: 07/30/03 (3G30056-BS1)										
Total Organic Carbon	10.3	1.0	mg/l	10.0		103	90-110			

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Fontana, CA 92337
Attention: Tony Morgan

Project ID: Antelope Valley

Report Number: CMG0155

Sampled: 07/25/03
Received: 07/25/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3G30056 Extracted: 07/30/03										
Matrix Spike Analyzed: 07/30/03 (3G30056-MS1)					**Source: IMG1194-02**					
Total Organic Carbon	11.0	1.0	mg/l	5.00	5.8	104	80-120			
Matrix Spike Dup Analyzed: 07/30/03 (3G30056-MSD1)					**Source: IMG1194-02**					
Total Organic Carbon	10.8	1.0	mg/l	5.00	5.8	100	80-120	2	20	
Batch: 3G31105 Extracted: 07/31/03										
Duplicate Analyzed: 07/31/03 (3G31105-DUP1)					**Source: IMG1565-01**					
Alkalinity as CaCO3	176	2.0	mg/l		180			2	20	
Bicarbonate Alkalinity as CaCO3	176	2.0	mg/l		180			2	20	
Carbonate Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Hydroxide Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Reference Analyzed: 07/31/03 (3G31105-SRM1)										
Alkalinity as CaCO3	308	2.0	mg/l	311		99	94-105			

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Layne Geosciences	Project ID: Antelope Valley	
11001 Etiwanda Avenue		Sampled: 07/25/03
Fontana, CA 92337	Report Number: CMG0155	Received: 07/25/03
Attention: Tony Morgan		

DATA QUALIFIERS AND DEFINITIONS

C Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.

H3 Sample was received and analyzed past holding time.

M1 The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

M2 The MS and/or MSD were below the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

M3 Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).

M-HA Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).

RL-1 Reporting limit raised due to sample matrix effects.

ND Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.

RPD Relative Percent Difference

T.O.N. Threshhold Odor Number

SI Units Saturation Index Units

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Report Number: CMG0155

Sampled: 07/25/03
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Certification Summary

Subcontracted Laboratories

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: EPA 120.1
Samples: CMG0155-01
Method Performed: EPA 150.1
Samples: CMG0155-01
Method Performed: EPA 160.1
Samples: CMG0155-01
Method Performed: EPA 160.2
Samples: CMG0155-01
Method Performed: EPA 170.1
Samples: CMG0155-01
Method Performed: EPA 180.1
Samples: CMG0155-01
Method Performed: EPA 200.7
Samples: CMG0155-01
Method Performed: EPA 200.7-Diss
Samples: CMG0155-01
Method Performed: EPA 200.8
Samples: CMG0155-01
Method Performed: EPA 200.8-Diss
Samples: CMG0155-01
Method Performed: EPA 218.6
Samples: CMG0155-01
Method Performed: EPA 245.1
Samples: CMG0155-01
Method Performed: EPA 245.1-Diss
Samples: CMG0155-01
Method Performed: EPA 300.0
Samples: CMG0155-01
Method Performed: EPA 350.3
Samples: CMG0155-01
Method Performed: EPA 365.3
Samples: CMG0155-01
Method Performed: EPA 415.1
Samples: CMG0155-01
Method Performed: SM 2330B
Samples: CMG0155-01
Method Performed: SM2120B
Samples: CMG0155-01
Method Performed: SM2150B
Samples: CMG0155-01

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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: Antelope Valley Report Number: CMG0155	 Sampled: 07/25/03 Received: 07/25/03

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: SM2320B

Samples: CMG0155-01

Method Performed: SM2340B

Samples: CMG0155-01

Method Performed: SM4500-CN-C,E

Samples: CMG0155-01

Method Performed: SM5540-C

Samples: CMG0155-01

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Jeanne Shoulder
Project Manager

CMG0155

Del Mar Analytical

Providing Quality Environmental Laboratory Services

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DRINKING WATER CHAIN OF CUSTODY FORM

Client Name: LAYNE
P.O./Project Name: Van Dam
Address: 11001 Etiwanda Ave
Project Manager: Lou Kohn / Tony Morgan
City: Fontana State: CA Zip: 92337
Compliance Sample: Yes ___ No X
POE #:
Tel: (909) 390-2833 Fax: (909) 390-6097
Data to state's database? Yes (PWS ID required) ___ No X
PWS ID#:
Sampler(s) Name & Signature: Lou Kohn [signature]
Samples acidified after dechlorination? Yes ___ No X

Sample I.D.	Matrix (see Matrix Table)	Date Sampled	Time	Number of Containers	Volatiles Reg. ☐ UnReg. ☐ 524.2	Trihalomethanes Only 524.2	Semivolatiles Reg. ☐ UnReg. ☐ 525.2	EDB / DBCP / TCP 504.1	Pesticides and PCBs 505 ☐ 508.1 ☐	Chlorinated Acids 515.3	Carbamates 531.1	Glyphosate 547	Endothall 548.1	Diquat / Paraquat 549.2	Coliform, Total ☐ Fecal ☐	Heterotrophic Plate Count (HPC)	Metals (Specify)	General Minerals (see fee schedule)	General Physical (see fee schedule)	Inorganic Chemicals (see fee schedule)	Diss-As T-Phosphate	Si, B, TOC, Cr6+	NH4, TSS, Br		
Van Dam #3 498'	GW	7/25	1325	9														X	X	X	X	X	X		

Metals:
- ☐ Aluminum
- ☐ Antimony
- ☐ Arsenic
- ☐ Barium
- ☐ Beryllium
- ☐ Boron
- ☐ Cadmium
- ☐ Calcium
- ☐ Chromium
- ☐ Copper
- ☐ Iron
- ☐ Lead
- ☐ Magnesium
- ☐ Manganese
- ☐ Mercury
- ☐ Nickel
- ☐ Potassium
- ☐ Selenium
- ☐ Silver
- ☐ Sodium
- ☐ Thallium
- ☐ Vanadium
- ☐ Zinc
- ☐ other: ______

Matrix Types
DW - Drinking Water
SW - Surface Water
RW - Raw Water (Source)
GW - Groundwater
RW - Recreational Water
TW - Treated Water (Point of Entry)

Relinquished by: Lou Kohn [signature]	Date/Time: 7/25 16:00	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received in Lab by: Jeanne [signature]	Date/Time: 7/25/03 16:00
Remarks:			

Turnaround Time*: (check one)
Normal X 7 day ___
72 Hours ___ 48 hours ___
24 Hours ___ Immediate ___
*Surcharges may be applied for remaining hold time <48 hours.

Sample Integrity: Temp: 0°C
Intact: ___ On Ice: X

Note: By relinquishing samples to Del Mar Analytical, client agrees to pay for the services requested on this chain of custody form and any additional analyses performed on this project. Payment for services is due within 30 days from the date of the invoice. Sample(s) will be disposed of after 30 days. All work is subject to Del Mar Analytical's terms and conditions unless previously agreed to in writing.

Form Rev. 3-27-03

Del Mar Analytical

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LABORATORY REPORT

Prepared For: Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project: WDS Van Dam

Sampled: 08/01/03
Received: 08/01/03
Issued: 08/18/03

CA ELAP #1169

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical. This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

SUBCONTRACTED: Refer to the last page for specific subcontract laboratory information included in this report.

LABORATORY ID	CLIENT ID	MATRIX
CMH0004-01	Van Dam #4 358'	Water

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Layne Geosciences
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Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: ug/l								
Aluminum	EPA 200.7	3H06080	50	**39000**	1	8/6/2003	8/7/2003	
Antimony	EPA 200.8	3H11042	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8	3H11042	1.0	**8.5**	1	8/11/2003	8/11/2003	
Barium	EPA 200.7	3H06080	10	**250**	1	8/6/2003	8/7/2003	
Beryllium	EPA 200.8	3H11042	0.50	**0.92**	1	8/11/2003	8/11/2003	
Boron	EPA 200.7	3H06080	50	ND	1	8/6/2003	8/7/2003	
Cadmium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7	3H06080	100	**35000**	1	8/6/2003	8/7/2003	
Chromium	EPA 200.7	3H06080	5.0	**82**	1	8/6/2003	8/7/2003	
Copper	EPA 200.7	3H06080	10	**56**	1	8/6/2003	8/7/2003	
Iron	EPA 200.7	3H06080	40	**56000**	1	8/6/2003	8/7/2003	
Lead	EPA 200.7	3H06080	5.0	**13**	1	8/6/2003	8/7/2003	
Magnesium	EPA 200.7	3H06080	20	**22000**	1	8/6/2003	8/7/2003	
Manganese	EPA 200.7	3H06080	20	**1100**	1	8/6/2003	8/7/2003	
Mercury	EPA 245.1	3H04054	0.20	**1.9**	1	8/4/2003	8/4/2003	
Nickel	EPA 200.7	3H06080	10	**65**	1	8/6/2003	8/7/2003	
Potassium	EPA 200.7	3H06080	500	**6600**	1	8/6/2003	8/7/2003	
Selenium	EPA 200.7	3H06080	5.0	ND	1	8/6/2003	8/7/2003	
Silicon	EPA 200.7	3H06080	51	**50000**	1	8/6/2003	8/8/2003	
Silver	EPA 200.7	3H06080	10	ND	1	8/6/2003	8/7/2003	
Sodium	EPA 200.7	3H06080	500	**36000**	1	8/6/2003	8/7/2003	
Thallium	EPA 200.8	3H11042	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7	3H06080	20	**120**	1	8/6/2003	8/7/2003	

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Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

DISSOLVED METALS

Sample ID: CMH0004-01 (Van Dam #4 358' - Water)

Reporting Units: ug/l

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Aluminum	EPA 200.7-Diss	3H14051	50	ND	1	8/14/2003	8/15/2003	
Antimony	EPA 200.8-Diss	3H11039	2.0	ND	1	8/11/2003	8/11/2003	
Arsenic	EPA 200.8-Diss	3H11039	1.0	**1.4**	1	8/11/2003	8/11/2003	
Barium	EPA 200.7-Diss	3H14051	10	**30**	1	8/14/2003	8/15/2003	
Beryllium	EPA 200.8-Diss	3H11039	0.50	ND	1	8/11/2003	8/11/2003	C
Boron	EPA 200.7-Diss	3H14051	50	ND	1	8/14/2003	8/15/2003	
Cadmium	EPA 200.8-Diss	3H11039	1.0	ND	1	8/11/2003	8/11/2003	
Calcium	EPA 200.7-Diss	3H14051	100	**18000**	1	8/14/2003	8/15/2003	
Chromium	EPA 200.7-Diss	3H14051	5.0	ND	1	8/14/2003	8/15/2003	
Copper	EPA 200.7-Diss	3H14051	10	ND	1	8/14/2003	8/15/2003	
Iron	EPA 200.7-Diss	3H14051	40	ND	1	8/14/2003	8/15/2003	
Lead	EPA 200.7-Diss	3H14051	5.0	ND	1	8/14/2003	8/15/2003	
Magnesium	EPA 200.7-Diss	3H14051	20	**2100**	1	8/14/2003	8/15/2003	
Manganese	EPA 200.7-Diss	3H14051	20	**25**	1	8/14/2003	8/15/2003	
Mercury	EPA 245.1-Diss	3H13076	0.20	ND	1	8/13/2003	8/13/2003	
Nickel	EPA 200.7-Diss	3H14051	10	ND	1	8/14/2003	8/15/2003	
Potassium	EPA 200.7-Diss	3H14051	500	**2300**	1	8/14/2003	8/15/2003	
Selenium	EPA 200.7-Diss	3H14051	5.0	ND	1	8/14/2003	8/15/2003	
Silicon	EPA 200.7-Diss	3H14051	51	**5000**	1	8/14/2003	8/15/2003	
Silver	EPA 200.7-Diss	3H14051	10	ND	1	8/14/2003	8/15/2003	
Sodium	EPA 200.7-Diss	3H14051	500	**33000**	1	8/14/2003	8/15/2003	
Thallium	EPA 200.8-Diss	3H11039	1.0	ND	1	8/11/2003	8/11/2003	
Zinc	EPA 200.7-Diss	3H14051	20	**24**	1	8/14/2003	8/15/2003	

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INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: °C								
Temperature	EPA 170.1	3H06051	NA	**23**	1	8/1/2003	8/1/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: Color Units								
Color	SM2120B	3H02041	1.0	**19**	1	8/2/2003	8/2/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: mg/l								
Alkalinity as CaCO3	SM2320B	3H08061	2.0	**130**	1	8/8/2003	8/8/2003	
Bicarbonate Alkalinity as CaCO3	SM2320B	3H08061	2.0	**130**	1	8/8/2003	8/8/2003	
Carbonate Alkalinity as CaCO3	SM2320B	3H08061	2.0	ND	1	8/8/2003	8/8/2003	
Hydroxide Alkalinity as CaCO3	SM2320B	3H08061	2.0	ND	1	8/8/2003	8/8/2003	
Ammonia-N	EPA 350.3	3H04032	0.50	ND	1	8/4/2003	8/4/2003	
Bromide	EPA 300.0	3H01037	0.50	ND	1	8/1/2003	8/1/2003	
Chloride	EPA 300.0	3H01037	0.50	**11**	1	8/1/2003	8/1/2003	
Chromium VI	EPA 7196A	3H01087	0.010	ND	1	8/1/2003	8/1/2003	
Total Cyanide	SM4500-CN-C,E	3H05061	0.025	ND	1	8/5/2003	8/5/2003	
Fluoride	EPA 300.0	3H01037	0.50	ND	1	8/1/2003	8/1/2003	
Hardness (as CaCO3)	SM2340B	3H06080	1.0	**180**	1	8/6/2003	8/7/2003	
Nitrate-NO3	EPA 300.0	3H01037	0.50	**11**	1	8/1/2003	8/1/2003	
Nitrite-N	EPA 300.0	3H01037	0.15	**0.17**	1	8/1/2003	8/1/2003	
Nitrate/Nitrite-N	EPA 300.0	3H01037	0.15	**2.7**	1	8/1/2003	8/1/2003	
Phosphorus	EPA 365.3	3H05050	0.050	**1.1**	1	8/5/2003	8/5/2003	
Sulfate	EPA 300.0	3H01037	0.50	**24**	1	8/1/2003	8/1/2003	
Surfactants (MBAS)	SM5540-C	3H01091	0.10	ND	1	8/1/2003	8/1/2003	
Total Dissolved Solids	EPA 160.1	3H06060	10	**240**	1	8/6/2003	8/6/2003	
Total Organic Carbon	EPA 415.1	3H07088	1.0	**3.9**	1	8/7/2003	8/7/2003	
Total Suspended Solids	EPA 160.2	3H05089	10	**3600**	1	8/5/2003	8/5/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: NTU								
Turbidity	EPA 180.1	3H02040	100	**2600**	100	8/2/2003	8/2/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: pH Units								
pH	EPA 150.1	3H01090	NA	**7.84**	1	8/1/2003	8/1/2003	
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: T.O.N.								
Odor	SM2150B	3H01089	1.0	ND	1	8/1/2003	8/1/2003	

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Report Number: CMH0004

Sampled: 08/01/03
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INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: umhos/cm								
Specific Conductance	EPA 120.1	3H06062	1.0	**320**	1	8/6/2003	8/6/2003	

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Received: 08/01/03

LANGLIER SATURATION INDEX

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: CMH0004-01 (Van Dam #4 358' - Water)								
Reporting Units: SI Units								
Langlier Index	SM 2330B	3H08066	0.010	**0.16**	1	8/8/2003	8/8/2003	

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Sampled: 08/01/03
Received: 08/01/03

SHORT HOLD TIME DETAIL REPORT

	Hold Time (in days)	Date/Time Sampled	Date/Time Received	Date/Time Extracted	Date/Time Analyzed
Sample ID: Van Dam #4 358' (CMH0004-01) - Water					
EPA 150.1	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 19:30	08/01/2003 20:45
EPA 170.1	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 07:30	08/01/2003 07:30
EPA 180.1	2	08/01/2003 07:30	08/01/2003 13:35	08/02/2003 14:00	08/02/2003 15:00
EPA 300.0	2	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 19:15	08/01/2003 19:29
EPA 7196A	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 20:00	08/01/2003 20:02
SM2120B	2	08/01/2003 07:30	08/01/2003 13:35	08/02/2003 13:00	08/02/2003 14:00
SM2150B	1	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 20:30	08/01/2003 21:15
SM5540-C	2	08/01/2003 07:30	08/01/2003 13:35	08/01/2003 20:43	08/01/2003 21:00

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H04054 Extracted: 08/04/03										
Blank Analyzed: 08/04/03 (3H04054-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 08/04/03 (3H04054-BS1)										
Mercury	7.82	0.20	ug/l	8.00		98	85-115			
Matrix Spike Analyzed: 08/04/03 (3H04054-MS1)					**Source: IMH0056-01**					
Mercury	7.69	0.20	ug/l	8.00	ND	96	70-130			
Matrix Spike Dup Analyzed: 08/04/03 (3H04054-MSD1)					**Source: IMH0056-01**					
Mercury	7.56	0.20	ug/l	8.00	ND	94	70-130	2	20	
Batch: 3H06080 Extracted: 08/06/03										
Blank Analyzed: 08/07/03 (3H06080-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H06080 Extracted: 08/06/03										
LCS Analyzed: 08/07/03 (3H06080-BS1)										
Aluminum	458	50	ug/l	500		92	85-115			
Barium	517	10	ug/l	500		103	85-115			
Boron	515	50	ug/l	500		103	85-115			
Calcium	2580	100	ug/l	2500		103	85-115			
Chromium	510	5.0	ug/l	500		102	85-115			
Copper	491	10	ug/l	500		98	85-115			
Iron	521	40	ug/l	500		104	85-115			
Lead	519	5.0	ug/l	500		104	85-115			
Magnesium	2620	20	ug/l	2500		105	85-115			
Manganese	510	20	ug/l	500		102	85-115			
Nickel	496	10	ug/l	500		99	85-115			
Potassium	4790	500	ug/l	5000		96	85-115			
Selenium	503	5.0	ug/l	500		101	85-115			
Silicon	2340	51	ug/l	2500		94	85-115			
Silver	254	10	ug/l	250		102	85-115			
Sodium	2570	500	ug/l	2500		103	85-115			
Zinc	503	20	ug/l	500		101	85-115			
Matrix Spike Analyzed: 08/07/03 (3H06080-MS1)					**Source: IMH0140-01**					
Aluminum	4220	50	ug/l	500	2600	324	70-130			*M-HA*
Barium	571	10	ug/l	500	62	102	70-130			
Boron	1550	50	ug/l	500	990	112	70-130			
Calcium	222000	100	ug/l	2500	220000	80	70-130			*M-HA*
Chromium	511	5.0	ug/l	500	4.2	101	70-130			
Copper	517	10	ug/l	500	11	101	70-130			
Iron	4410	40	ug/l	500	3500	182	70-130			*M-HA*
Lead	501	5.0	ug/l	500	3.8	99	70-130			
Magnesium	59600	20	ug/l	2500	56000	144	70-130			*M-HA*
Manganese	654	20	ug/l	500	150	101	70-130			
Nickel	466	10	ug/l	500	6.2	92	70-130			
Potassium	9830	500	ug/l	5000	4800	101	70-130			
Selenium	530	5.0	ug/l	500	16	103	70-130			
Silicon	25000	51	ug/l	2500	21000	160	70-130			*M-HA*
Silver	258	10	ug/l	250	ND	103	70-130			
Sodium	96700	500	ug/l	2500	92000	188	70-130			*M-HA*

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METHOD BLANK/QC DATA

METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H06080 Extracted: 08/06/03										
Matrix Spike Analyzed: 08/07/03 (3H06080-MS1)					**Source: IMH0140-01**					
Zinc	558	20	ug/l	500	52	101	70-130			
Matrix Spike Dup Analyzed: 08/07/03 (3H06080-MSD1)					**Source: IMH0140-01**					
Aluminum	4250	50	ug/l	500	2600	330	70-130	1	20	*M-HA*
Barium	572	10	ug/l	500	62	102	70-130	0	20	
Boron	1550	50	ug/l	500	990	112	70-130	0	20	
Calcium	221000	100	ug/l	2500	220000	40	70-130	1	20	*M-HA*
Chromium	515	5.0	ug/l	500	4.2	102	70-130	1	20	
Copper	517	10	ug/l	500	11	101	70-130	0	20	
Iron	4460	40	ug/l	500	3500	192	70-130	1	20	*M-HA*
Lead	505	5.0	ug/l	500	3.8	100	70-130	1	20	
Magnesium	59500	20	ug/l	2500	56000	140	70-130	0	20	*M-HA*
Manganese	654	20	ug/l	500	150	101	70-130	0	20	
Nickel	469	10	ug/l	500	6.2	93	70-130	1	20	
Potassium	9690	500	ug/l	5000	4800	98	70-130	1	20	
Selenium	540	5.0	ug/l	500	16	105	70-130	2	20	
Silicon	25000	51	ug/l	2500	21000	160	70-130	0	20	*M-HA*
Silver	258	10	ug/l	250	ND	103	70-130	0	20	
Sodium	95000	500	ug/l	2500	92000	120	70-130	2	20	*M-HA*
Zinc	558	20	ug/l	500	52	101	70-130	0	20	
Batch: 3H11042 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11042-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							

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11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam
Report Number: CMH0004

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11042 Extracted: 08/11/03										
LCS Analyzed: 08/11/03 (3H11042-BS1)										
Antimony	90.5	2.0	ug/l	80.0		113	85-115			
Arsenic	88.5	1.0	ug/l	80.0		111	85-115			
Beryllium	83.0	0.50	ug/l	80.0		104	85-115			
Cadmium	85.1	1.0	ug/l	80.0		106	85-115			
Thallium	84.2	1.0	ug/l	80.0		105	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11042-MS1)					**Source: IMH0411-01**					
Antimony	82.3	2.0	ug/l	80.0	0.49	102	70-130			
Arsenic	119	1.0	ug/l	80.0	34	106	70-130			
Beryllium	74.8	0.50	ug/l	80.0	ND	94	70-130			
Cadmium	71.5	1.0	ug/l	80.0	0.092	89	70-130			
Thallium	79.0	1.0	ug/l	80.0	ND	99	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11042-MSD1)					**Source: IMH0411-01**					
Antimony	82.2	2.0	ug/l	80.0	0.49	102	70-130	0	20	
Arsenic	119	1.0	ug/l	80.0	34	106	70-130	0	20	
Beryllium	76.2	0.50	ug/l	80.0	ND	95	70-130	2	20	
Cadmium	71.4	1.0	ug/l	80.0	0.092	89	70-130	0	20	
Thallium	79.2	1.0	ug/l	80.0	ND	99	70-130	0	20	

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DISSOLVED METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H11039 Extracted: 08/11/03										
Blank Analyzed: 08/11/03 (3H11039-BLK1)										
Antimony	ND	2.0	ug/l							
Arsenic	ND	1.0	ug/l							
Beryllium	ND	0.50	ug/l							
Cadmium	ND	1.0	ug/l							
Thallium	ND	1.0	ug/l							
LCS Analyzed: 08/11/03 (3H11039-BS1)										
Antimony	86.1	2.0	ug/l	80.0		108	85-115			
Arsenic	87.1	1.0	ug/l	80.0		109	85-115			
Beryllium	90.8	0.50	ug/l	80.0		114	85-115			
Cadmium	82.7	1.0	ug/l	80.0		103	85-115			
Thallium	82.0	1.0	ug/l	80.0		102	85-115			
Matrix Spike Analyzed: 08/11/03 (3H11039-MS1)					**Source: CMH0004-01**					
Antimony	87.3	2.0	ug/l	80.0	0.78	108	70-130			
Arsenic	89.5	1.0	ug/l	80.0	1.4	110	70-130			
Beryllium	90.3	0.50	ug/l	80.0	ND	113	70-130			
Cadmium	82.2	1.0	ug/l	80.0	0.047	103	70-130			
Thallium	82.2	1.0	ug/l	80.0	ND	103	70-130			
Matrix Spike Dup Analyzed: 08/11/03 (3H11039-MSD1)					**Source: CMH0004-01**					
Antimony	87.9	2.0	ug/l	80.0	0.78	109	70-130	1	20	
Arsenic	89.8	1.0	ug/l	80.0	1.4	110	70-130	0	20	
Beryllium	92.5	0.50	ug/l	80.0	ND	116	70-130	2	20	
Cadmium	82.5	1.0	ug/l	80.0	0.047	103	70-130	0	20	
Thallium	82.9	1.0	ug/l	80.0	ND	104	70-130	1	20	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H13076 Extracted: 08/13/03										
Blank Analyzed: 08/13/03 (3H13076-BLK1)										
Mercury	ND	0.20	ug/l							
LCS Analyzed: 08/13/03 (3H13076-BS1)										
Mercury	8.25	0.20	ug/l	8.00		103	85-115			
Matrix Spike Analyzed: 08/13/03 (3H13076-MS1)					**Source: CMH0004-01**					
Mercury	7.75	0.20	ug/l	8.00	ND	97	70-130			
Matrix Spike Dup Analyzed: 08/13/03 (3H13076-MSD1)					**Source: CMH0004-01**					
Mercury	7.80	0.20	ug/l	8.00	ND	98	70-130	1	20	
Batch: 3H14051 Extracted: 08/14/03										
Blank Analyzed: 08/15/03 (3H14051-BLK1)										
Aluminum	ND	50	ug/l							
Barium	ND	10	ug/l							
Boron	ND	50	ug/l							
Calcium	ND	100	ug/l							
Chromium	ND	5.0	ug/l							
Copper	ND	10	ug/l							
Iron	ND	40	ug/l							
Lead	ND	5.0	ug/l							
Magnesium	ND	20	ug/l							
Manganese	ND	20	ug/l							
Nickel	ND	10	ug/l							
Potassium	ND	500	ug/l							
Selenium	ND	5.0	ug/l							
Silicon	ND	51	ug/l							
Silver	ND	10	ug/l							
Sodium	ND	500	ug/l							
Zinc	ND	20	ug/l							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14051 Extracted: 08/14/03										
LCS Analyzed: 08/15/03 (3H14051-BS1)										**M-NR1**
Aluminum	498	50	ug/l	500		100	85-115			
Barium	539	10	ug/l	500		108	85-115			
Boron	492	50	ug/l	500		98	85-115			
Calcium	2570	100	ug/l	2500		103	85-115			
Chromium	510	5.0	ug/l	500		102	85-115			
Copper	515	10	ug/l	500		103	85-115			
Iron	518	40	ug/l	500		104	85-115			
Lead	506	5.0	ug/l	500		101	85-115			
Magnesium	2560	20	ug/l	2500		102	85-115			
Manganese	524	20	ug/l	500		105	85-115			
Nickel	517	10	ug/l	500		103	85-115			
Potassium	5200	500	ug/l	5000		104	85-115			
Selenium	511	5.0	ug/l	500		102	85-115			
Silicon	2700	51	ug/l	2500		108	85-115			
Silver	255	10	ug/l	250		102	85-115			
Sodium	2600	500	ug/l	2500		104	85-115			
Zinc	500	20	ug/l	500		100	85-115			
LCS Dup Analyzed: 08/15/03 (3H14051-BSD1)										
Aluminum	486	50	ug/l	500		97	85-115	2	20	
Barium	525	10	ug/l	500		105	85-115	3	20	
Boron	480	50	ug/l	500		96	85-115	2	20	
Calcium	2570	100	ug/l	2500		103	85-115	0	20	
Chromium	504	5.0	ug/l	500		101	85-115	1	20	
Copper	508	10	ug/l	500		102	85-115	1	20	
Iron	512	40	ug/l	500		102	85-115	1	20	
Lead	504	5.0	ug/l	500		101	85-115	0	20	
Magnesium	2530	20	ug/l	2500		101	85-115	1	20	
Manganese	525	20	ug/l	500		105	85-115	0	20	
Nickel	511	10	ug/l	500		102	85-115	1	20	
Potassium	5140	500	ug/l	5000		103	85-115	1	20	
Selenium	511	5.0	ug/l	500		102	85-115	0	20	
Silicon	2630	51	ug/l	2500		105	85-115	3	20	
Silver	248	10	ug/l	250		99	85-115	3	20	
Sodium	2590	500	ug/l	2500		104	85-115	0	20	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H14051 Extracted: 08/14/03										
LCS Dup Analyzed: 08/15/03 (3H14051-BSD1)										
Zinc	495	20	ug/l	500		99	85-115	1	20	

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INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H01037 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01037-BLK1)										
Bromide	ND	0.50	mg/l							
Chloride	ND	0.50	mg/l							
Fluoride	ND	0.50	mg/l							
Nitrate-NO3	ND	0.50	mg/l							
Nitrite-N	ND	0.15	mg/l							
Nitrate/Nitrite-N	ND	0.15	mg/l							
Sulfate	ND	0.50	mg/l							
LCS Analyzed: 08/01/03 (3H01037-BS1)										
Bromide	4.74	0.50	mg/l	5.00		95	90-110			
Chloride	4.64	0.50	mg/l	5.00		93	90-110			*M3*
Fluoride	4.78	0.50	mg/l	5.00		96	90-110			
Nitrate-NO3	4.91	0.50	mg/l	5.00		98	90-110			
Nitrite-N	1.43	0.15	mg/l	1.52		94	90-110			
Sulfate	9.70	0.50	mg/l	10.0		97	90-110			*M3*
Matrix Spike Analyzed: 08/01/03 (3H01037-MS1)					**Source: IMH0049-02**					
Bromide	6.07	2.5	mg/l	5.00	2.0	81	80-120			
Fluoride	6.00	2.5	mg/l	5.00	1.2	96	80-120			
Nitrate-NO3	5.99	2.5	mg/l	5.00	ND	120	80-120			
Nitrite-N	4.23	0.75	mg/l	1.52	ND	278	80-120			*M1*
Matrix Spike Dup Analyzed: 08/01/03 (3H01037-MSD1)					**Source: IMH0049-02**					
Bromide	6.62	2.5	mg/l	5.00	2.0	92	80-120	9	20	
Fluoride	6.15	2.5	mg/l	5.00	1.2	99	80-120	2	20	
Nitrate-NO3	5.52	2.5	mg/l	5.00	ND	110	80-120	8	20	
Nitrite-N	5.02	0.75	mg/l	1.52	ND	330	80-120	17	20	*M1*

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H01087 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01087-BLK1)										
Chromium VI	ND	0.010	mg/l							
LCS Analyzed: 08/01/03 (3H01087-BS1)										
Chromium VI	0.0975	0.010	mg/l	0.100		97	90-110			
Matrix Spike Analyzed: 08/01/03 (3H01087-MS1)					**Source: CMH0004-01**					
Chromium VI	0.311	0.010	mg/l	0.300	ND	104	85-115			
Matrix Spike Dup Analyzed: 08/01/03 (3H01087-MSD1)					**Source: CMH0004-01**					
Chromium VI	0.301	0.010	mg/l	0.300	ND	100	85-115	3	20	
Batch: 3H01089 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01089-BLK1)										
Odor	ND	1.0	T.O.N.							
Batch: 3H01090 Extracted: 08/01/03										
Duplicate Analyzed: 08/01/03 (3H01090-DUP1)					**Source: IMH0056-01**					
pH	8.87	NA	pH Units		8.85			0	5	
Batch: 3H01091 Extracted: 08/01/03										
Blank Analyzed: 08/01/03 (3H01091-BLK1)										
Surfactants (MBAS)	ND	0.10	mg/l							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H01091 Extracted: 08/01/03										
LCS Analyzed: 08/01/03 (3H01091-BS1)										
Surfactants (MBAS)	0.230	0.10	mg/l	0.250		92	90-110			
Matrix Spike Analyzed: 08/01/03 (3H01091-MS1)					**Source: CMH0004-01**					
Surfactants (MBAS)	0.235	0.10	mg/l	0.250	ND	94	50-125			
Matrix Spike Dup Analyzed: 08/01/03 (3H01091-MSD1)					**Source: CMH0004-01**					
Surfactants (MBAS)	0.237	0.10	mg/l	0.250	ND	95	50-125	1	20	
Batch: 3H02040 Extracted: 08/02/03										
Blank Analyzed: 08/02/03 (3H02040-BLK1)										
Turbidity	ND	1.0	NTU							
Duplicate Analyzed: 08/02/03 (3H02040-DUP1)					**Source: IMH0089-01**					
Turbidity	2.13	1.0	NTU		2.1			1	20	
Batch: 3H02041 Extracted: 08/02/03										
Duplicate Analyzed: 08/02/03 (3H02041-DUP1)					**Source: CMH0004-01**					
Color	19.0	1.0	Color Units		19			0	20	
Batch: 3H04032 Extracted: 08/04/03										
Blank Analyzed: 08/04/03 (3H04032-BLK1)										
Ammonia-N	ND	0.50	mg/l							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H04032 Extracted: 08/04/03										
LCS Analyzed: 08/04/03 (3H04032-BS1)										
Ammonia-N	1.14	0.50	mg/l	1.00		114	85-115			
Matrix Spike Analyzed: 08/04/03 (3H04032-MS1)					**Source: IMH0056-01**					
Ammonia-N	2.08	0.50	mg/l	2.00	ND	104	75-125			
Matrix Spike Dup Analyzed: 08/04/03 (3H04032-MSD1)					**Source: IMH0056-01**					
Ammonia-N	2.03	0.50	mg/l	2.00	ND	102	75-125	2	15	
Batch: 3H05050 Extracted: 08/05/03										
Blank Analyzed: 08/05/03 (3H05050-BLK1)										
Phosphorus	ND	0.050	mg/l							
LCS Analyzed: 08/05/03 (3H05050-BS1)										
Phosphorus	0.963	0.050	mg/l	1.00		96	80-120			
Matrix Spike Analyzed: 08/05/03 (3H05050-MS1)					**Source: IMH0081-01**					
Phosphorus	1.05	0.050	mg/l	1.00	0.034	102	65-130			
Matrix Spike Dup Analyzed: 08/05/03 (3H05050-MSD1)					**Source: IMH0081-01**					
Phosphorus	1.04	0.050	mg/l	1.00	0.034	101	65-130	1	15	
Batch: 3H05061 Extracted: 08/05/03										
Blank Analyzed: 08/05/03 (3H05061-BLK1)										
Total Cyanide	ND	0.025	mg/l							

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11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H05061 Extracted: 08/05/03										
LCS Analyzed: 08/05/03 (3H05061-BS1)										
Total Cyanide	0.189	0.025	mg/l	0.200		94	90-110			
Matrix Spike Analyzed: 08/05/03 (3H05061-MS1)					**Source: IMG1569-01**					
Total Cyanide	0.190	0.025	mg/l	0.200	ND	95	70-115			
Matrix Spike Dup Analyzed: 08/05/03 (3H05061-MSD1)					**Source: IMG1569-01**					
Total Cyanide	0.192	0.025	mg/l	0.200	ND	96	70-115	1	15	
Batch: 3H05089 Extracted: 08/05/03										
Blank Analyzed: 08/05/03 (3H05089-BLK1)										
Total Suspended Solids	ND	10	mg/l							
LCS Analyzed: 08/05/03 (3H05089-BS1)										
Total Suspended Solids	1010	10	mg/l	1000		101	85-115			
Duplicate Analyzed: 08/05/03 (3H05089-DUP1)					**Source: IMH0139-01**					
Total Suspended Solids	ND	10	mg/l		ND				5	
Batch: 3H06060 Extracted: 08/06/03										
Blank Analyzed: 08/06/03 (3H06060-BLK1)										
Total Dissolved Solids	ND	10	mg/l							
Duplicate Analyzed: 08/06/03 (3H06060-DUP1)					**Source: IMH0125-01**					
Total Dissolved Solids	371	10	mg/l		370			0	20	

Del Mar Analytical, Colton
Jeanne Shoulder
Project Manager

Del Mar Analytical

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Layne Geosciences
11001 Etiwanda Avenue
Fontana, CA 92337
Attention: Tony Morgan

Project ID: WDS Van Dam

Report Number: CMH0004

Sampled: 08/01/03
Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H06060 Extracted: 08/06/03										
Reference Analyzed: 08/06/03 (3H06060-SRM1)										
Total Dissolved Solids	986	10	mg/l	1000		99	90-110			
Batch: 3H06062 Extracted: 08/06/03										
Duplicate Analyzed: 08/06/03 (3H06062-DUP1)					**Source: IMH0125-01**					
Specific Conductance	578	1.0	umhos/cm		570			1	5	
Batch: 3H06080 Extracted: 08/06/03										
Blank Analyzed: 08/07/03 (3H06080-BLK1)										
Hardness (as CaCO3)	ND	1.0	mg/l							
Batch: 3H07088 Extracted: 08/07/03										
Blank Analyzed: 08/07/03 (3H07088-BLK1)										
Total Organic Carbon	ND	1.0	mg/l							
LCS Analyzed: 08/07/03 (3H07088-BS1)										
Total Organic Carbon	9.60	1.0	mg/l	10.0		96	90-110			
Matrix Spike Analyzed: 08/07/03 (3H07088-MS1)					**Source: IMH0056-01**					
Total Organic Carbon	7.99	1.0	mg/l	5.00	2.9	102	80-120			
Matrix Spike Dup Analyzed: 08/07/03 (3H07088-MSD1)					**Source: IMH0056-01**					
Total Organic Carbon	7.47	1.0	mg/l	5.00	2.9	91	80-120	7	20	

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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: WDS Van Dam Report Number: CMH0004	 Sampled: 08/01/03 Received: 08/01/03

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 3H08061 Extracted: 08/08/03										
Duplicate Analyzed: 08/08/03 (3H08061-DUP1)					**Source: CMH0004-01**					
Alkalinity as CaCO3	128	2.0	mg/l		130			2	20	
Bicarbonate Alkalinity as CaCO3	128	2.0	mg/l		130			2	20	
Carbonate Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Hydroxide Alkalinity as CaCO3	ND	2.0	mg/l		ND				20	
Reference Analyzed: 08/08/03 (3H08061-SRM1)										
Alkalinity as CaCO3	302	2.0	mg/l	311		97	94-105			

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Layne Geosciences	Project ID: WDS Van Dam	
11001 Etiwanda Avenue		Sampled: 08/01/03
Fontana, CA 92337	Report Number: CMH0004	Received: 08/01/03
Attention: Tony Morgan		

DATA QUALIFIERS AND DEFINITIONS

C	Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.
M1	The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
M3	Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).
M-HA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
M-NR1	There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike/Blank Spike Duplicate.
ND	Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.
RPD	Relative Percent Difference
T.O.N.	Threshhold Odor Number
SI Units	Saturation Index Units

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Project Manager

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Layne Geosciences 11001 Etiwanda Avenue Fontana, CA 92337 Attention: Tony Morgan	Project ID: WDS Van Dam Report Number: CMH0004	 Sampled: 08/01/03 Received: 08/01/03

Certification Summary

Subcontracted Laboratories

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: EPA 120.1
Samples: CMH0004-01
Method Performed: EPA 150.1
Samples: CMH0004-01
Method Performed: EPA 160.1
Samples: CMH0004-01
Method Performed: EPA 160.2
Samples: CMH0004-01
Method Performed: EPA 170.1
Samples: CMH0004-01
Method Performed: EPA 180.1
Samples: CMH0004-01
Method Performed: EPA 200.7
Samples: CMH0004-01
Method Performed: EPA 200.7-Diss
Samples: CMH0004-01
Method Performed: EPA 200.8
Samples: CMH0004-01
Method Performed: EPA 200.8-Diss
Samples: CMH0004-01
Method Performed: EPA 245.1
Samples: CMH0004-01
Method Performed: EPA 245.1-Diss
Samples: CMH0004-01
Method Performed: EPA 300.0
Samples: CMH0004-01
Method Performed: EPA 350.3
Samples: CMH0004-01
Method Performed: EPA 365.3
Samples: CMH0004-01
Method Performed: EPA 415.1
Samples: CMH0004-01
Method Performed: EPA 7196A
Samples: CMH0004-01
Method Performed: SM 2330B
Samples: CMH0004-01
Method Performed: SM2120B
Samples: CMH0004-01
Method Performed: SM2150B
Samples: CMH0004-01

Del Mar Analytical, Colton
Jeanne Shoulder
Project Manager

Layne Geosciences	Project ID: WDS Van Dam	
11001 Etiwanda Avenue		Sampled: 08/01/03
Fontana, CA 92337	Report Number: CMH0004	Received: 08/01/03
Attention: Tony Morgan		

Del Mar Analytical - Irvine *NELAP Accreditation #01108CA, CA ELAP Cert #1197, AZ DHS Licence #AZ0428 and NV Cert #CA-72*

2852 Alton Ave. - Irvine, CA 92606

Method Performed: SM2320B

Samples: CMH0004-01

Method Performed: SM2340B

Samples: CMH0004-01

Method Performed: SM4500-CN-C,E

Samples: CMH0004-01

Method Performed: SM5540-C

Samples: CMH0004-01

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Providing Quality Environmental Laboratory Services

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DRINKING WATER CHAIN OF CUSTODY FORM

Client Name: Layne
Address: 11001 Etiwanda Ave
City: Fontana State: CA Zip: 92337
Tel: (909) 390-2833 Fax: 909 390-6097
Sampler(s) Name & Signature: Lou Kotm [signature]

P.O./Project Name: WDS Van Dam
Project Manager: Lou Kotm / Tony Morgan
Compliance Sample: Yes ___ No X POE #:
Data to state's database? Yes (PWS ID required) ___ No X PWS ID#:
Samples acidified after dechlorination? Yes ___ No X

Sample I.D.	Matrix (see Matrix Table)	Date Sampled	Time	Number of Containers	Volatiles Reg.☐ UnReg.☐ 524.2	Trihalomethanes Only 524.2	Semivolatiles Reg.☐ UnReg.☐ 525.2	EDB / DBCP / TCP 504.1	Pesticides and PCBs 505 ☐ 508.1 ☐	Chlorinated Acids 515.3	Carbamates 531.1	Glyphosate 547	Endothall 548.1	Diquat / Paraquat 549.2	Coliform, Total ☐ Fecal ☐	Heterotrophic Plate Count (HPC)	Metals (Specify)	General Minerals (see fee schedule)	General Physical (see fee schedule)	Inorganic Chemicals (see fee schedule)	Diss-As T Phosphate	Si, B, TOC, Cr 6+	NH4, TSS, Br		
Van Dam #4 (358)	GW	8/1	0730	9														X	X	X	X	X	X		

☐ Aluminum
☐ Antimony
☐ Arsenic
☐ Barium
☐ Beryllium
☐ Boron
☐ Cadmium
☐ Calcium
☐ Chromium
☐ Copper
☐ Iron
☐ Lead

☐ Magnesium
☐ Manganese
☐ Mercury
☐ Nickel
☐ Potassium
☐ Selenium
☐ Silver
☐ Sodium
☐ Thallium
☐ Vanadium
☐ Zinc
☐ other: ______

Matrix Types
DW - Drinking Water
SW - Surface Water
RW - Raw Water (Source)
GW - Groundwater
RW - Recreational Water
TW - Treated Water (Point of Entry)

Relinquished by: Lou Kotm [signature] Date/Time: 8/1/03 1335
Received by: Date/Time:
Relinquished by: Date/Time:
Received by: Date/Time:
Relinquished by: Date/Time:
Received in Lab by: Jeanne [signature] Date/Time: 8/1/03 13:35
Remarks:

Turnaround Time*: (check one)
Normal X 7 day ___
72 Hours ___ 48 hours ___
24 Hours ___ Immediate ___
*Surcharges may be applied for remaining hold time <48 hours.

Sample Integrity: Temp: 7°C
Intact: ___ On Ice: X

Form Rev. 3-27-03

Appendix C
Air Data

Appendix C
Introduction

Lynn Wall of Jones and Stokes Associates prepared the tables contained in this appendix using the emissions estimation software developed for the Port of Los Angeles. This software is based on models developed by the Sacramento Air District. Assumptions regarding the sources of emissions are based on the Project Description in Chapter 3 and additional construction and operations details provided by the applicant. Those details also are summarized in this appendix.

Ms. Wall has 11 years' experience in environmental assessments for air, noise, hazardous material, wastewater, and other environmental issues. She is experienced with all aspects of air quality management for construction projects, stationary sources, and transportation projects. She has conducted ambient air quality monitoring and is experienced with "hot spot" air quality analyses for transportation projects using U.S. EPA's MOBILE6 and CAL3QHC models. She has conducted emission inventories and air quality assessments for mobile sources, including railroads, airports, and marine operations.

Phase 1 Put System (Put from AVEK West Feeder Only): No pumpage required

Phase 1 Take System (Recovery to AVEK West Feeder Only): Wells manifold to booster pumps at the pump-in points to the AVEK West Feeder

Well	Required Power (HP)
25	390
22	333
23	351
24	370
21	371
20	380
19	394
30	374
31	403
39	412
26	179
18	466
17	170
38	188
37	180
36	195
29	190
Booster Pump	5041
Total	10386
Number of wells	

	Nox	VOC	CO	PM10
Emission factor (EF)	0.15g/bhp-	0.15g/bhp-	0.6g/bhp-h	0.02g/bhp-hr
Tons/yr *	**8.4**	**8.4**	**33.4**	**1.1**

Phase 2 Take System (Recovery to AVEK West Feeder and LAA#2 or New Pipeline): Wells manifolded to boster pump to AVEK West Feeder and LAA#2 or New Pipeline

Well	Required Power (HP)
25	390
22	333
23	351
24	370
21	371
20	380
19	394
30	374
31	403
39	412
26	179
18	466
17	170
38	188
37	180
36	195
29	190
Booster Pump	5041

8	166
6	157
7	160
32	167
13	172
10	164
9	167
5	174
4	179
33	186
34	186
35	189
Booster Pump	1634
27	171
28	165
11	169
12	175
3	181
2	189
0	191
Booster Pump	953
16	189
14	181
15	179
1	190
Booster Pump	545

Total 17569 HP
Number of wells

Pump Run Time **4872 hours per year of operation** **24 hour operations 203 days per year**

	Nox	VOC	CO	PM10
Emission factor (FF)	0.15g/bhp-hr	0.15g/bhp-	0.6g/bhp-hr	0.02g/bhp-hr
Tons/yr *	**14.1**	**14.1**	**56.6**	**1.9**

* where emissions = EF/454*total HP*Run Time/2000

Port of Los Angeles Construction Emissions Calculator, Version 1.3

Emission Estimates for -> Antelope Valley water supply					Exhaust	Fugitive Dust
Project Phases (English Units)	**ROG (lbs/day)**	**CO (lbs/day)**	**NO_X (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**	**PM10 (lbs/day)**
Construction	39.5	335.2	238.8	132.0	7.0	125.0
SCAQMD Threshold (lbs/day)	75	550	100	150		
Significant Impact?	**No**	**No**	**Yes**	**No**		

Notes: Project Start Year -> 2006

Project Length (months) -> 6

Total Project Area (acres) -> 1612

Maximum Area Disturbed/Day (acres) -> 25

Total Soil Imported/Exported (yd^3/day)-> 0

PM10 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I.

Emission Estimates for -> Antelope Valley water supply					Exhaust	Fugitive Dust
Project Phases (Metric Units)	**ROG (kgs/day)**	**CO (kgs/day)**	**NO_X (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**	**PM10 (kgs/day)**
Construction	18.0	152.4	108.6	60.0	3.2	56.8

Notes: Project Start Year -> 2006

Project Length (months) -> 6

Total Project Area (hectares) -> 652

Maximum Area Disturbed/Day (hectares) -> 10

Total Soil Imported/Exported ($meters^3$/day)-> 0

PM10 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I.

Port of Los Angeles Construction Emissions Calculator, Version 1.3
Data Entry Worksheet

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a
yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C18.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

Input Type		
Project Name	ntelope Valley water supply	
Construction Start Year	2006	Enter a Year between 2000 and 2010 inclusive
Project Construction Time	6	months
Total Project Area	1612	acres
Maximum Area Disturbed/Day	25	acres
Average Truck Capacity	16	yd^3 (assume 20 if unknown)

or User Override (for program calculated

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Worker commute default values can be overridden in cells C35 through C37.

Worker Commute Emissions	User Override of Worker Commute Default Values	Default Values		
Miles/one-way trip	30	20		
One-way trips/day	4	2		
No. of employees	4	24		
	ROG	**NO_x**	**CO**	**PM10**
Emission rate (grams/mile)	0.36	0.67	7.41	0.04
Emission rate (grams/trip)	1.86	0.82	18.48	0.02
Pounds per day	0.5	0.8	9.1	0.0

Water truck default values can be overriden in cells C49 and E49.

Water Truck Emissions	Number of Water Trucks	Program Estimate of Number of Water Trucks	User Override of Water Truck Feet Traveled	Default Values Feet Traveled/Day	
Construction - Exhaust	5	5		211,200	200
	ROG	**NO_x**	**CO**	**PM10**	
Emission rate (grams/mile)	0.85	10.00	8.59	0.30	
Pound per day	0.4	4.4	3.8	0.1	

Fugitive dust default values can be overridden in cell C59.

Fugitive PM10 Dust	User Override of Max Acrerage/Day	Default Maximum Acreage/Day	pounds/day	
Fugitive Dust - Construction		25	125.0	3

The number of off-road equipment pieces can be input in cells C76 through C105.
The model year for off-road equipment can be input in cells D76 through D105. Choose from either one of the following years:

1. Pre-1996
2. 1996-2000
3. 2001+

Default hours of operation for off-road equipment can be overridden in cells E76 through E105
Default horsepower for off-road equipment can be overridden in cells F76 through F105
Default load factors for off-road equipment can be overridden in cells G76 through G105
Mitigation for off-road equipment can be input in cells M76 through M105, N76 through N105, and O76 through O105.

Off-Road Equipment Emissions

Construction	User Input		Default values				Emissions				Mitigation		
											Purinox	Lean-NO_X Catalyst or Diesel Oxidation Catalyst	Diesel Particulate Filter
Construction Equipment	Nuber of Equipment Pieces	Equipment Model Year: - Pre-1996 - 1996-2000 - 2001+	Hours/day	Horsepower	Load Factor		**ROG**	**CO**	**NO_X**	**PM10**	1 = Yes 2 = No	1 = Yes 2 = No	1 = Yes 2 = No
Bore/Drill rig			8	218	0.75		0.00	0.00	0.00	0.00			
Concrete/Industrial saw			8	84	0.73		0.00	0.00	0.00	0.00			
Crane	1		8	190	0.43		1.44	5.89	16.89	0.85			
Crawler tractor			8	143	0.575		0.00	0.00	0.00	0.00			
Crushing/Processing equipment			8	154	0.78		0.00	0.00	0.00	0.00			
Excavators	4	1996-2000	8	180	0.58		7.36	62.55	42.68	1.18			
Grader	4	1996-2000	8	174	0.575		7.05	59.94	40.90	1.13			
Off-highway tractor			8	255	0.41		0.00	0.00	0.00	0.00			
Off-highway truck			8	417	0.49		0.00	0.00	0.00	0.00			
Other construction equipment			8	190	0.62		0.00	0.00	0.00	0.00			
Paver			8	132	0.59		0.00	0.00	0.00	0.00			
Paving equipment			8	111	0.53		0.00	0.00	0.00	0.00			
Roller			8	114	0.43		0.00	0.00	0.00	0.00			
Rough terrain forklift			8	94	0.475		0.00	0.00	0.00	0.00			
Rubber-tired dozers	4	1996-2000	8	352	0.59		14.64	124.43	84.90	2.34			
Rubber-tired loaders			8	165	0.465		0.00	0.00	0.00	0.00			
Scrapers	1	1996-2000	8	313	0.66		3.64	30.94	21.11	0.58			
Signal boards			8	119	0.82		0.00	0.00	0.00	0.00			
Skid steer loaders			8	62	0.515		0.00	0.00	0.00	0.00			
Surfacing equipment			8	437	0.49		0.00	0.00	0.00	0.00			
Tractors/Loaders/Backhoes	2	1996-2000	8	79	0.465		1.29	11.00	7.51	0.21			
Trenchers	3	1996-2000	8	82	0.695		3.01	25.61	17.47	0.48			
Cat 950F loader			8	170	0.465		0.00	0.00	0.00	0.00			
Case 590 backhoe			8	80	0.465		0.00	0.00	0.00	0.00			
Cat 140G grader			8	200	0.575		0.00	0.00	0.00	0.00			
Case 9050B excavator			8	240	0.575		0.00	0.00	0.00	0.00			
Link-Belt 218 crane			8	266	0.43		0.00	0.00	0.00	0.00			
Cat 988 wheeled loader			8	475	0.475		0.00	0.00	0.00	0.00			
IHC SC-75 hydrohammer with P-250 power pack			8	335	0.62		0.00	0.00	0.00	0.00			
Fermec 650B skip			8	79	0.465		0.00	0.00	0.00	0.00			
						max pounds per day	38.4	320.4	231.5	6.8			

Default load factors from SCAQMD CEQA Handbook, 1993.

The number of additional on-road heavy duty trucks can be input in cells C117 through C119.
The number of delivery trucks can be input in cells C129 through C130.
The number of additional on-road pickups/light duty trucks can be input in cells C138 through C140.

Additional On-Road Vehicles

Number of heavy duty trucks		
Miles/round trip		
Round trips/day/truck		0

	A	B	C	D	E	F
120		Vehicle miles traveled/day	0			
121						
122		**Heavy duty truck emissions**	**ROG**	**NO_x**	**CO**	**PM10**
123		Emission rate (grams/mile)	0.85	10.00	8.59	0.30
124		Heavy duty truck emissions (pounds per day)	0.0	0.0	0.0	0.0
125						
126						
127		**Delivery Truck Emissions**	User Override of			
128		**User Input**	Soil Hauling Defaults	Default Values		
129		Miles/round trip	0	30		
130		Round trips/day	200	0		
131		Vehicle miles traveled/day (calculated)	50	0		
132						
133		**Hauling Emissions**	**ROG**	**NO_x**	**CO**	**PM10**
134		Emission rate (grams/mile)	0.85	10.00	8.59	0.30
135		Pounds per day	0.1	1.1	0.9	0.0
136						
137						
138		**Number of pickups/light duty trucks**				
139		Miles/one-way trip				
140		One-way trips/day				
141		Vehicle miles traveled/day	0			
142						
143		**Pickup/light duty truck emissions**	**ROG**	**NO_x**	**CO**	**PM10**
144		Emission rate (grams/mile)	0.36	0.67	7.41	0.04
145		Emission rate (grams/trip)	1.86	0.82	18.48	0.02
146		Pickup/light duty truck emissions (pounds per day)	0.0	0.0	0.0	0.0
147		Total additional on-road emissions (pounds per day)	0.1	1.1	0.9	0.0

Light Duty Truck @ 30 mph

	Running Exhaust (g/mi)								Tire Wear (g/mi)	Break Wear (g/mi)	Start Emission Rate @ 480 min (g/trip)								20 minutes Hot Soak (g/trip)		20 minutes Evaporative Running Loss (g/mi)	
Model Year	ROG	Weighted	NOx	Weighted	CO	Weighted	PM10	Weighted	PM10	PM10	ROG	Weighted	NOx	Weighted	CO	Weighted	PM10	Weighted	ROG	Weighted	ROG	Weighted
2000	0.52	0.00	1.27	0.00	13.10	0.00	0.02	0.00	0.01	0.01	2.37	0.00	1.18	0.00	29.73	0.00	0.02	0.00	0.57	0.00	0.13	0.00
2001	0.47	0.00	1.16	0.00	11.89	0.00	0.02	0.00	0.01	0.01	2.20	0.00	1.12	0.00	27.37	0.00	0.02	0.00	0.53	0.00	0.12	0.00
2002	0.40	0.00	1.01	0.00	10.58	0.00	0.02	0.00	0.01	0.01	1.99	0.00	1.03	0.00	24.78	0.00	0.02	0.00	0.49	0.00	0.12	0.00
2003	0.36	0.00	0.90	0.00	9.67	0.00	0.02	0.00	0.01	0.01	1.84	0.00	0.97	0.00	22.95	0.00	0.02	0.00	0.46	0.00	0.11	0.00
2004	0.32	0.00	0.81	0.00	8.77	0.00	0.02	0.00	0.01	0.01	1.69	0.00	0.91	0.00	21.20	0.00	0.02	0.00	0.44	0.00	0.11	0.00
2005	0.28	0.00	0.72	0.00	7.94	0.00	0.02	0.00	0.01	0.01	1.56	0.00	0.86	0.00	19.60	0.00	0.02	0.00	0.41	0.00	0.10	0.00
2006	0.26	0.26	0.67	0.67	7.41	7.41	0.02	0.02	0.01	0.01	1.46	1.46	0.82	0.82	18.48	18.48	0.02	0.02	0.40	0.40	0.10	0.10
2007	0.29	0.00	0.61	0.00	6.83	0.00	0.02	0.00	0.01	0.01	1.45	0.00	0.77	0.00	17.32	0.00	0.02	0.00	0.38	0.00	0.09	0.00
2008	0.21	0.00	0.55	0.00	6.25	0.00	0.02	0.00	0.01	0.01	1.25	0.00	0.72	0.00	16.13	0.00	0.02	0.00	0.37	0.00	0.09	0.00
2009	0.18	0.00	0.49	0.00	5.66	0.00	0.02	0.00	0.01	0.01	1.14	0.00	0.67	0.00	14.88	0.00	0.02	0.00	0.35	0.00	0.09	0.00
2010	0.16	0.00	0.44	0.00	5.10	0.00	0.02	0.00	0.01	0.01	1.04	0.00	0.62	0.00	13.67	0.00	0.02	0.00	0.33	0.00	0.08	0.00
		0.26		0.67		7.41		0.02				1.46		0.82		18.48		0.02		0.40		0.10

Heavy Duty Truck @ 30 mph

	Running Exhaust (g/mi)								Tire Wear (g/mi)		Break Wear (g/mi)		Start Emission Rate @ 480 min (g/trip)								20 minutes Hot Soak (g/trip)		20 minutes Evaporative Running Loss (g/mi)	
Model Year	ROG	Weighted	NOx	Weighted	CO	Weighted	PM10	Weighted	PM10	Weighted	PM10	Weighted	ROG	Weighted	NOx	Weighted	CO	Weighted	PM10	Weighted	ROG	Weighted	ROG	Weighted
2000	1.12	0.00	13.23	0.00	14.06	0.00	0.38	0.00	0.03	0.00	0.01	0.00	7.72	0.00	4.32	0.00	124.87	0.00	0.01	0.00	0.25	0.00	0.06	0.00
2001	1.07	0.00	12.88	0.00	12.94	0.00	0.36	0.00	0.03	0.00	0.01	0.00	7.36	0.00	4.27	0.00	118.03	0.00	0.01	0.00	0.23	0.00	0.06	0.00
2002	1.01	0.00	12.53	0.00	11.90	0.00	0.33	0.00	0.03	0.00	0.01	0.00	7.00	0.00	4.15	0.00	111.63	0.00	0.01	0.00	0.22	0.00	0.05	0.00
2003	0.96	0.00	11.86	0.00	11.00	0.00	0.32	0.00	0.03	0.00	0.01	0.00	6.67	0.00	4.03	0.00	105.71	0.00	0.01	0.00	0.21	0.00	0.05	0.00
2004	0.91	0.00	11.21	0.00	10.15	0.00	0.30	0.00	0.03	0.00	0.01	0.00	6.32	0.00	3.93	0.00	99.68	0.00	0.01	0.00	0.19	0.00	0.05	0.00
2005	0.85	0.00	10.58	0.00	9.30	0.00	0.29	0.00	0.03	0.00	0.01	0.00	5.93	0.00	3.82	0.00	93.40	0.00	0.01	0.00	0.18	0.00	0.05	0.00
2006	0.80	0.80	10.00	10.00	8.59	8.59	0.26	0.26	0.03	0.03	0.01	0.01	5.58	5.58	3.70	3.70	87.83	87.83	0.01	0.01	0.17	0.17	0.05	0.05
2007	0.84	0.00	9.30	0.00	7.90	0.00	0.25	0.00	0.03	0.00	0.01	0.00	5.60	0.00	3.58	0.00	82.12	0.00	0.01	0.00	0.16	0.00	0.05	0.00
2008	0.70	0.00	8.63	0.00	7.25	0.00	0.23	0.00	0.03	0.00	0.01	0.00	4.90	0.00	3.44	0.00	77.18	0.00	0.01	0.00	0.14	0.00	0.05	0.00
2009	0.65	0.00	7.99	0.00	6.67	0.00	0.22	0.00	0.03	0.00	0.01	0.00	4.57	0.00	3.31	0.00	72.34	0.00	0.01	0.00	0.13	0.00	0.05	0.00
2010	0.60	0.00	7.23	0.00	6.11	0.00	0.20	0.00	0.03	0.00	0.01	0.00	4.27	0.00	3.16	0.00	67.83	0.00	0.01	0.00	0.12	0.00	0.05	0.00
		0.80		10.00		8.59		0.26		0.03		0.01		5.58		3.70		87.83		0.01		0.17		0.05

	Emission Factor (grams/brake-hp-hr)			
Year	ROG	CO	NOx	PM10
Pre-1996	1.00	4.09	11.73	0.59
1996-2000	1.00	8.50	6.90	0.40
2001+	1.00	8.50	5.80	0.16

Item	Construction Acres	Permanent Acres	Notes
Wells	39	4	30 to 40 new wells for a total of 30 to 40 construction acres and 3 to 4 permanent acres
Well piping system (Phase 1)	97		
Well piping system (Phase 1 and 2)	245	0	
84" pipeline	78	0	21,156 ft long, 160 foot construction width, mostly on project owned land
Distribution canals	95	31	Entirely on project owned land
Peripheral berms	219	42	Entirely on project owned land
Recharge basin levees	57	57	Tractor path is same as berm width
Recharge basins	0	1,482	No internal work, defined by levees
Cultural (unchanged)	16	16	

Item	Cubic Yards Moved		Notes
Well piping system	125,824		
84" pipeline	215,476		
Distribution canals	219,114		Conservative, a precise cut/fill balance has not been computed
Peripheral berms	209,847		
Recharge basin levees	172,181		Periodically repeated as needed, mimics farming
Recharge basins	0		
Total in Year 1	942,442		
Total in Year 1 not including levees	770,261		Levee work mimics farming
Periodic amount as levees are re-built (up to)	172,181		

Item	Phase 1	Phase 2 (total)	Notes
Number of wells	17	40	Some will be existing wells, have conservatively assumed only 5
Average well pump power (HP)	314	235	
Total well pump power (HP)	5,346	9,396	
Booster station power (HP)	5,041	8,173	Phase 1 booster sized for the AVEK feeder pressure - which is 2X that of LAA#2
Total pump power (HP)	**10,386**	**17,569**	
84 inch pipeline length (miles)	4	4	
Recovery piping	7	18	
Well field flow rate (cfs)	149	242	

Notes:
Well pumps may alternately be sized to eliminate boosters

Phase 1 Put System (Put from AVEK West Feeder Only): No pumpage required

Phase 1 Take System (Recovery to AVEK West Feeder Only): Wells manifold to booster pumps at the pump-in points to the AVEK West Feeder

Well	Well Flow (gpm)	Well Flow (cfs)	Lateral Flow (cfs)	Sub-Main Flow (cfs)	Main Flow (cfs)	Lateral Length (ft)	Sub-Main Length (ft)	Main Length (ft)	Lateral Diameter (in)	Sub-Main Diameter (in)	Main Diameter (in)	Lateral Velocity (fps)	Sub-Main Velocity (fps)	Main Velocity (fps)	Lateral Material	Sub-Main Material	Main Material	Lateral Specific Roughness (ft)	Sub-Main Specific Roughness (ft)	Main Specific Roughness (ft)	Water Temp (F)	Water Density (lbm/ft3)	Kinematic Viscosity (ft2/sec)	Lateral Relative Roughness (ft)	Sub-Main Relative Roughness (ft)	Main Relative Roughness (ft)
25	5,111	11	11	11	11	1,489	0	9,188	24		84	3.6		0.3	PVC		RCP	0.000005		0.004	60	62.37	1.217E-05	0.000000017		0.00000397
22	5,111	11	11	11		2,741	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
23	5,111	11	11	23		10	2,649		24	30		3.6	4.6		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000017	0.0000111	
24	5,111	11	11	34	46	10	1,292	9,188	24	36	84	3.6	4.8	1.2	PVC	CCP	RCP	0.000005	0.004	0.004	60	62.37	1.217E-05	0.000000017	0.0000093	0.00000397
21	5,111	11	11	11		2,884	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
20	5,111	11	11	23		10	2,492		24	30		3.6	4.6		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000017	0.0000111	
19	5,111	11	11	34	80	10	1,292	6,500	24	36	84	3.6	4.8	2.1	PVC	CCP	RCP	0.000005	0.004	0.004	60	62.37	1.217E-05	0.000000017	0.0000093	0.00000397
30	5,111	11	11	11		2,786	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
31	5,111	11	11	23		10	2,467		24	30		3.6	4.6		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000017	0.0000111	
39	5,111	11	11	34	114	10	1,839	5,311	24	36	84	3.6	4.8	3.0	PVC	CCP	RCP	0.000005	0.004	0.004	60	62.37	1.217E-05	0.000000017	0.0000093	0.00000397
26	1,813	4	4			2,500	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
18	5,111	11	11			2,517	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
17	1,813	4	4	19		10	1,845		10	24		7.4	6.2		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000042	0.0000000	
38	1,813	4	4			2,308	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
37	1,813	4	4	8		10	1,898		10	16		7.4	5.8		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000042	0.0000000	
36	1,813	4	4			1,884	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
29	1,813	4	4			1,929	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
Booster Pump	67,099	149																			60	62.37	1.217E-05			
Total	**67,099**	**149**																								
Number of wells	**17**																									

Well	Lateral Reynolds Number (-)	Sub-Main Reynolds Number (-)	Main Reynolds Number (-)	Lateral Friction Factor (-)	Sub-Main Friction Factor (-)	Main Friction Factor (-)	Lateral Frictional Head Loss (ft)	Sub-Main Frictional Head Loss (ft)	Main Frictional Head Loss (ft)	Lateral Frictional Head Loss (ft/100 ft)	Sub-Main Frictional Head Loss (ft/100 ft)	Main Frictional Head Loss (ft/100 ft)	Lateral Start Elevation (ft)	Sub-Main Start Elevation (ft)	Main Start Elevation (ft)	Lateral End Elevation (ft)	Sub-Main End Elevation (ft)	Main End Elevation (ft)	Lateral ElevationGain/Loss (ft)	Sub-Main Elevation Gain/Loss (ft)	Main Elevation Gain/Loss (ft)	Dynamic Depth to Water in Well (ft)	Receiving Pipeline Pressure (psi)	Receiving Pipeline Head (ft)	Lateral Head Requirement (ft)	Downstream Piping Head Requirement (ft)	Total Pumping Head Requirement (ft)	Pump Efficiency (%)	Required Power (HP)
25	5.96E+05		1.70E+05	0.0128		0.0161	1.9		0.0	0.13		0.0003	2,625		2,633	2,633		2,578	8	0	-55	300	0	0	310	-53	257	85%	390
22	5.96E+05			0.0128			3.6			0.13			2,670			2,655			-15	0	0	300			289	-69	220	85%	333
23	5.96E+05	9.54E+05		0.0128	0.012		0.0	4.3		0.13	0.16		2,655	2,655		2,655	2,638		0	-17	0	300			300	-69	231	85%	351
24	5.96E+05	1.19E+06	6.81E+05	0.0128	0.013	0.0123	0.0	2.0	0.4	0.13	0.16	0.0038	2,638	2,638	2,633	2,638	2,633	2,578	0	-5	-55	300	0	0	300	-56	244	85%	370
21	5.96E+05			0.0128			3.8			0.13			2,645			2,635			-10	0	0	300			294	-49	245	85%	371
20	5.96E+05	9.54E+05		0.0128	0.012		0.0	4.0		0.13	0.16		2,635	2,635		2,635	2,622		0	-13	0	300			300	-49	251	85%	380
19	5.96E+05	1.19E+06	1.19E+06	0.0128	0.013	0.0112	0.0	2.0	0.7	0.13	0.16	0.0107	2,622	2,622	2,615	2,622	2,615	2,578	0	-7	-37	300	0	0	300	-40	260	85%	394
30	5.96E+05			0.0128			3.6			0.13			2,630			2,607			-23	0	0	300			281	-34	247	85%	374
31	5.96E+05	9.54E+05		0.0128	0.012		0.0	4.0		0.13	0.16		2,620	2,620		2,620	2,610		0	-10	0	300			300	-34	266	85%	403
39	5.96E+05	1.19E+06	1.70E+06	0.0128	0.013	0.0108	0.0	2.9	1.1	0.13	0.16	0.0210	2,610	2,610	2,607	2,610	2,607	2,578	0	-3	-29	300	0	0	300	-28	272	85%	412
26	5.07E+05			0.0132			33.8			1.35			2,610			2,593			-17	0	0	325			342	-8	333	85%	179
18	5.96E+05			0.0128			3.3			0.13			2,605			2,593			-12	0	0	325			316	-8	308	85%	466
17	5.07E+05	1.02E+06		0.0132	0.0118		0.1	6.5		1.35	0.35		2,593	2,593		2,593	2,578		0	-15	0	325			325	-8	317	85%	170
38	5.07E+05			0.0132			31.2			1.35			2,594			2,578			-16	0	0	325			340	9	349	85%	188
37	5.07E+05	6.34E+05		0.0132	0.0125		0.1	9.3		1.35	0.49		2,578	2,578		2,578	2,578		0	0	0	325			325	9	334	85%	180
36	5.07E+05			0.0132			25.4			1.35			2,565			2,578			13	0	0	325			363	0	363	85%	195
29	5.07E+05			0.0132			26.1			1.35			2,575			2,578			3	0	0	325			354	0	354	85%	190
Booster Pump	0.00E+00																						110	253				85%	5,041
Total																													**10,386**

Phase 2 Take System (Recovery to AVEK West Feeder and LAA#2 or New Pipeline): Wells manifolded to boster pump to AVEK West Feeder and LAA#2 or New Pipeline

Well	Well Flow (gpm)	Well Flow (cfs)	Lateral Flow (cfs)	Sub-Main Flow (cfs)	Main Flow (cfs)	Lateral Length (ft)	Sub-Main Length (ft)	Main Length (ft)	Lateral Diameter (in)	Sub-Main Diameter (in)	Main Diameter (in)	Lateral Velocity (fps)	Sub-Main Velocity (fps)	Main Velocity (fps)	Lateral Material	Sub-Main Material	Main Material	Lateral Specific Roughness (ft)	Sub-Main Specific Roughness (ft)	Main Specific Roughness (ft)	Water Temp (F)	Water Density (lbm/ft3)	Kinematic Viscosity (ft2/sec)	Lateral Relative Roughness (ft)	Sub-Main Relative Roughness (ft)	Main Relative Roughness (ft)
25	5,111	11	11	11	11	1,489	0	9,188	24		84	3.6		0.3	PVC		RCP	0.000005		0.004	60	62.37	1.217E-05	0.000000017		0.00000397
22	5,111	11	11	11		2,741	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
23	5,111	11	11	23		10	2,649		24	30		3.6	4.6		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000017	0.0000111	
24	5,111	11	11	34	46	10	1,292	9,188	24	36	84	3.6	4.8	1.2	PVC	CCP	RCP	0.000005	0.004	0.004	60	62.37	1.217E-05	0.000000017	0.0000093	0.00000397
21	5,111	11	11	11		2,884	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
20	5,111	11	11	23		10	2,492		24	30		3.6	4.6		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000017	0.0000111	
19	5,111	11	11	34	80	10	1,292	6,500	24	36	84	3.6	4.8	2.1	PVC	CCP	RCP	0.000005	0.004	0.004	60	62.37	1.217E-05	0.000000017	0.0000093	0.00000397
30	5,111	11	11	11		2,786	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
31	5,111	11	11	23		10	2,467		24	30		3.6	4.6		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000017	0.0000111	
39	5,111	11	11	34	114	10	1,839	5,311	24	36	84	3.6	4.8	3.0	PVC	CCP	RCP	0.000005	0.004	0.004	60	62.37	1.217E-05	0.000000017	0.0000093	0.00000397
26	1,813	4	4			2,500	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
18	5,111	11	11			2,517	0		24			3.6			PVC			0.000005			60	62.37	1.217E-05	0.000000017		
17	1,813	4	4	19		10	1,845		10	24		7.4	6.2		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000042	0.0000000	
38	1,813	4	4			2,308	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
37	1,813	4	4	8		10	1,898		10	16		7.4	5.8		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000042	0.0000000	
36	1,813	4	4			1,884	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
29	1,813	4	4			1,929	0		10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
Booster Pump	67,099	149																			60	62.37	1.217E-05			
8	1,813	4	4			2,726			10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
6	1,813	4	4	8		10	2,721		10	16		7.4	5.8		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000026	0.0000000	
7	1,813	4	4	12		10	2,759		10	24		7.4	3.9		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
32	1,813	4	4	16		10	2,550		10	24		7.4	5.1		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
13	1,813	4	4			2,777			10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
10	1,813	4	4	8		10	2,568		10	16		7.4	5.8		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000026	0.0000000	
9	1,813	4	4	12		10	2,804		10	24		7.4	3.9		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
5	1,813	4	4	16		10	2,416		10	24		7.4	5.1		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
4	1,813	4	4	20		10	2,782		10	30		7.4	4.1		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000014	0.0000111	
33	1,813	4	4	40		10	2,781		10	36		7.4	5.7		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000012	0.0000093	
34	1,813	4	4	44		10	2,646		10	36		7.4	6.3		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000012	0.0000093	
35	1,813	4	4	48		10	1,237		10	42		7.4	5.0		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000010	0.0000079	
Booster Pump	21,756	48							10																	
27	1,813	4	4			2,664			10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
28	1,813	4	4	8		10	2,587		10	16		7.4	5.8		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000026	0.0000000	
11	1,813	4	4	12		10	2,644		10	24		7.4	3.9		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
12	1,813	4	4	16		10	2,796		10	24		7.4	5.1		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
3	1,813	4	4	20		10	2,454		10	30		7.4	4.1		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000014	0.0000111	
2	1,813	4	4	24		10	2,682		10	30		7.4	4.9		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000014	0.0000111	
0	1,813	4	4	28		10	1,237		10	30		7.4	5.8		PVC	CCP		0.000005	0.004		60	62.37	1.217E-05	0.000000014	0.0000111	
Booster Pump	12,691	28																								
16	1,813	4	4			2,569			10			7.4			PVC			0.000005			60	62.37	1.217E-05	0.000000042		
14	1,813	4	4	8		10	2,722		10	16		7.4	5.8		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000026	0.0000000	
15	1,813	4	4	12		10	2,986		10	24		7.4	3.9		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
1	1,813	4	4	16		10	1,352		10	24		7.4	5.1		PVC	PVC		0.000005	0.000005		60	62.37	1.217E-05	0.000000017	0.0000000	
Booster Pump	7,252	16																								
Total	**108,798**	**242**																								
Number of wells	**40**																									

Well	Lateral Reynolds Number (-)	Sub-Main Reynolds Number (-)	Main Reynolds Number (-)	Lateral Friction Factor (-)	Sub-Main Friction Factor (-)	Main Friction Factor (-)	Lateral Frictional Head Loss (ft)	Sub-Main Frictional Head Loss (ft)	Main Frictional Head Loss (ft)	Lateral Frictional Head Loss (ft/100 ft)	Sub-Main Frictional Head Loss (ft/100 ft)	Main Frictional Head Loss (ft/100 ft)	Lateral Start Elevation (ft)	Sub-Main Start Elevation (ft)	Main Start Elevation (ft)	Lateral End Elevation (ft)	Sub-Main End Elevation (ft)	Main End Elevation (ft)	Lateral ElevationGain/Loss (ft)	Sub-Main Elevation Gain/Loss (ft)	Main Elevation Gain/Loss (ft)	Dynamic Depth to Water in Well (ft)	Receiving Pipeline Pressure (psi)	Receiving Pipeline Head (ft)	Lateral Head Requirement (ft)	Downstream Piping Head Requirement (ft)	Total Pumping Head Requirement (ft)	Pump Efficiency (%)	Required Power (HP)
25	5.96E+05		1.70E+05	0.0128		0.0161	1.9		0.0	0.13		0.0003	2,625		2,633	2,633		2,578	8	0	-55	300	0	0	310	-53	257	85%	390
22	5.96E+05			0.0128			3.6			0.13			2,670			2,655			-15	0	0	300			289	-69	220	85%	333
23	5.96E+05	9.54E+05		0.0128	0.012		0.0	4.3		0.13	0.16		2,655	2,655		2,655	2,638		0	-17	0	300			300	-69	231	85%	351
24	5.96E+05	1.19E+06	6.81E+05	0.0128	0.013	0.0123	0.0	2.0	0.4	0.13	0.16	0.0038	2,638	2,638	2,633	2,638	2,633	2,578	0	-5	-55	300	0	0	300	-56	244	85%	370
21	5.96E+05			0.0128			3.8			0.13			2,645			2,635			-10	0	0	300			294	-49	245	85%	371
20	5.96E+05	9.54E+05		0.0128	0.012		0.0	4.0		0.13	0.16		2,635	2,635		2,635	2,622		0	-13	0	300			300	-49	251	85%	380
19	5.96E+05	1.19E+06	1.19E+06	0.0128	0.013	0.0112	0.0	2.0	0.7	0.13	0.16	0.0107	2,622	2,622	2,615	2,622	2,615	2,578	0	-7	-37	300	0	0	300	-40	260	85%	394
30	5.96E+05			0.0128			3.6			0.13			2,630			2,607			-23	0	0	300			281	-34	247	85%	374
31	5.96E+05	9.54E+05		0.0128	0.012		0.0	4.0		0.13	0.16		2,620	2,620		2,620	2,610		0	-10	0	300			300	-34	266	85%	403
39	5.96E+05	1.19E+06	1.70E+06	0.0128	0.013	0.0108	0.0	2.9	1.1	0.13	0.16	0.0210	2,610	2,610	2,607	2,610	2,607	2,578	0	-3	-29	300	0	0	300	-28	272	85%	412
26	5.07E+05			0.0132			33.8			1.35			2,610			2,593			-17	0	0	325			342	-8	333	85%	179
18	5.96E+05			0.0128			3.3			0.13			2,605			2,593			-12	0	0	325			316	-8	308	85%	466
17	5.07E+05	1.02E+06		0.0132	0.0118		0.1	6.5		1.35	0.35		2,593	2,593		2,593	2,578		0	-15	0	325			325	-8	317	85%	170
38	5.07E+05			0.0132			31.2			1.35			2,594			2,578			-16	0	0	325			340	9	349	85%	188
37	5.07E+05	6.34E+05		0.0132	0.0125		0.1	9.3		1.35	0.49		2,578	2,578		2,578	2,578		0	0	0	325			325	9	334	85%	180
36	5.07E+05			0.0132			25.4			1.35			2,565			2,578			13	0	0	325			363	0	363	85%	195
29	5.07E+05			0.0132			26.1			1.35			2,575			2,578			3	0	0	325			354	0	354	85%	190
Booster Pump	0.00E+00																						110	253				85%	5,041
8	5.07E+05			0.0132			36.8			1.35			2,544			2,525			-19	0	0	350			368	-58	309	85%	166
6	8.12E+05	6.34E+05		0.0120	0.0125		0.1	13.4		1.23	0.49		2,525	2,525		2,525	2,506		0	-19	0	350			350	-58	292	85%	157
7	1.22E+06	6.34E+05		0.0116	0.0125		0.1	4.0		1.19	0.15		2,506	2,506		2,506	2,488		0	-18	0	350			350	-53	297	85%	160
32	1.22E+06	8.46E+05		0.0116	0.012		0.1	6.3		1.19	0.25		2,488	2,488		2,488	2,487		0	-1	0	350			350	-39	311	85%	167
13	5.07E+05			0.0132			37.5			1.35			2,578			2,555			-23	0	0	350			365	-44	320	85%	172
10	8.12E+05	6.34E+05		0.0120	0.0125		0.1	12.6		1.23	0.49		2,555	2,555		2,555	2,537		0	-18	0	350			350	-44	306	85%	164
9	1.22E+06	6.34E+05		0.0116	0.0125		0.1	4.1		1.19	0.15		2,537	2,537		2,537	2,520		0	-17	0	350			350	-39	311	85%	167
5	1.22E+06	8.46E+05		0.0116	0.012		0.1	6.0		1.19	0.25		2,520	2,520		2,520	2,505		0	-15	0	350			350	-26	324	85%	174
4	1.52E+06	8.46E+05		0.0115	0.012		0.1	3.5		1.18	0.13		2,505	2,505		2,505	2,488		0	-17	0	350			350	-17	333	85%	179
33	1.83E+06	1.41E+06		0.0050	0.011		0.1	5.2		0.51	0.19		2,488	2,488		2,488	2,483		0	-5	0	350			350	-3	347	85%	186
34	1.83E+06	1.55E+06		0.0050	0.009		0.1	4.9		0.51	0.19		2,483	2,483		2,483	2,473		0	-10	0	350			350	-4	347	85%	186
35	2.13E+06	1.45E+06		0.0020	0.011		0.0	1.5		0.20	0.12		2,473	2,473		2,473	2,473		0	0	0	350			350	2	352	85%	189
Booster Pump																							110	253				85%	1,634
27	5.07E+05			0.0132			36.0			1.35			2,592			2,567			-25	0	0	350			361	-43	318	85%	171
28	8.12E+05	6.34E+05		0.0120	0.0125		0.1	12.7		1.23	0.49		2,567	2,567		2,567	2,547		0	-20	0	350			350	-43	308	85%	165
11	1.22E+06	6.34E+05		0.0116	0.0125		0.1	3.8		1.19	0.15		2,547	2,547		2,547	2,533		0	-14	0	350			350	-35	315	85%	169
12	1.22E+06	8.46E+05		0.0116	0.0120		0.1	6.9		1.19	0.25		2,533	2,533		2,533	2,515		0	-18	0	350			350	-25	325	85%	175
3	1.52E+06	8.46E+05		0.0115	0.0120		0.1	3.1		1.18	0.13		2,515	2,515		2,515	2,497		0	-18	0	350			350	-14	336	85%	181
2	1.52E+06	1.01E+06		0.0115	0.0118		0.1	4.8		1.18	0.18		2,497	2,497		2,497	2,487		0	-10	0	350			350	1	351	85%	189
0	1.52E+06	1.18E+06		0.0115	0.0118		0.1	3.0		1.18	0.24		2,487	2,487		2,487	2,490		0	3	0	350			350	6	356	85%	191
Booster Pump																							110	253				85%	953
16	5.07E+05			0.0132			34.7			1.35			2,557			2,537			-20	0	0	350			365	-13	352	85%	189
14	8.12E+05	6.34E+05		0.0120	0.0125		0.1	13.4		1.23	0.49		2,537	2,537		2,537	2,527		0	-10	0	350			350	-13	337	85%	181
15	1.22E+06	6.34E+05		0.0116	0.0125		0.1	4.3		1.19	0.15		2,527	2,527		2,527	2,502		0	-25	0	350			350	-16	334	85%	179
1	1.22E+06	8.46E+05		0.0116	0.012		0.1	3.4		1.19	0.25		2,502	2,502		2,502	2,503		0	1	0	350			350	4	354	85%	190
Booster Pump																							110	253				85%	545
Total																													**17,569**

Item																
Pipe diameter (inches)	10	12	14	16	18	20	24	30	36	42	48	54	60	72	84	**Total**
Material	PVC	PVC	PVC	PVC	PVC	PVC	PVC	CCP	CCP	CCP	CCP	RCP	RCP	RCP	RCP	
Max flow (cfs)	3.8	4.6	5.2	8.1	8.4	9.2	18.4	27.6	46.9	64.4	76.3	86.5	126.4	150.0	350.0	
Excavation wall slope (run/rise, ft/ft)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Cover over pipe (ft)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Minimum space between pipe and sidewall (ft)	0.6	0.4	0.4	0.3	0.7	1.2	1.0	1.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Depth of bed fill below pipe (ft)	0.2	0.2	0.2	0.2	0.2	0.03	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Fluff factor (-)	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	
Total depth (ft)	3.0	3.2	3.4	3.5	3.7	3.7	4.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0	10.0	
Total excavation width (ft)	2.0	1.9	1.9	2.0	3.0	4.0	4.0	22.5	24.0	26.0	28.0	30.0	32.0	36.0	40.0	
Disturbed ground construction corridor width (ft)	100	100	100	100	120	120	120	120	120	120	160	160	160	160	160	
Disturbed ground construction corridor area (acres per linear ft)	0.0023	0.0023	0.0023	0.0023	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0037	0.0037	0.0037	0.0037	0.0037	
Trench volume (cu/yd per linear foot)	0.24	0.24	0.27	0.29	0.45	0.60	0.65	3.19	3.67	4.30	4.99	5.73	6.52	8.25	10.19	
Linear feet (from GIS)	19,357	0	0	12,494	0	0	34,568	16,762	9,850	1,237	0	0	0	0	21,156	**115,425**
Area of construction disturbance (acres)	44	0	0	29	0	0	95	46	27	3	0	0	0	0	78	**323**
Volume of earth excavated (cubic yards)	4,733	0	0	3,596	0	0	22,533	53,523	36,116	5,323	0	0	0	0	215,476	**341,300**
Phase 1 linear feet (from GIS)	8,620	0	0	1,898	0	0	14,261	7,608	4,423	0	0	0	0	0	21,156	**57,966**
Phase 1 area of construction disturbance (acres)	20	0	0	4	0	0	39	21	12	0	0	0	0	0	78	**174**

Distribution Canal	Linear Feet	Desired Capacity (cfs)	Type	Down Canal Slope (ft/ft)	Bottom Width (ft)	Depth Below Water Line (ft)	Interior Side Slope Run/Rise	Mannings Resistance Coeff, n	Mannings Number	Submerged Side Slope Length (ft)	Waterline Width (ft)	Wetted Perimeter (ft)	Wetted Area (ft2)	Down Canal Slope (ft/ft)	Hydraulic Radius	Velocity (fps)	Q (cfs)	Required Freeboard (ft)	Berm to berm width (ft)	Interior Volume (cy/ft)	Berm Crest Width (ft)	Exterior Run/Rise Slope	Berm 1 Volume (cy/ft)	Berm 2 Volume (cy/ft)	Fluff factor	Total Volume of Earth Moved (cy)	Total width (external toe to toe, ft)	Permanent Area (acres)	Construction Corridor width (ft)	Construction Area (acres)
West Lateral																														
188.2 cfs	2,600	188.2	Earthen Ditch	0.006985	3.3	3.2	1.5	0.025	59.6	6	13	15	26	0.006985	1.7	7.23	**188**	2	19	2.1	8	2.0	3.3	3.3	1.15	26,104	56	3	50	9
121 cfs	2,650	121.0	Earthen Ditch	0.005721	1.5	3.2	1.5	0.025	59.6	6	11	13	20	0.005721	1.5	6.02	**121**	2	17	1.8	8	2.0	3.3	3.3	1.15	25,519	54	3	50	9
63.8 cfs	2,800	63.8	Earthen Ditch	0.003929	1.0	2.8	1.5	0.025	59.6	5	9	11	14	0.003929	1.3	4.45	**64**	2	15	1.4	8	2.0	2.9	2.9	1.15	23,277	50	3	50	10
33.6 cfs	3,100	33.6	Earthen Ditch	0.003871	1.0	2.1	1.5	0.025	59.6	4	7	9	9	0.003871	1.0	3.78	**34**	2	13	1.1	8	2.0	2.3	2.3	1.15	20,494	46	3	50	10
30.2 cfs	2,600	30.2	Earthen Ditch	0.006154	1.0	1.8	1.5	0.025	59.6	3	7	8	7	0.006154	0.9	4.38	**30**	2	13	1.0	8	2.0	2.1	2.1	1.15	15,379	44	3	50	9
Mid Lateral																														
16.8 cfs	1,350	16.8	Earthen Ditch	0.008148	1.0	1.3	1.5	0.025	59.6	2	5	6	4	0.008148	0.7	4.20	**17**	2	11	0.7	8	2.0	1.7	1.7	1.15	6,454	40	1	50	4
East Lateral																														
131 cfs	2,600	131.0	Earthen Ditch	0.005000	2.2	3.2	1.5	0.025	59.6	6	12	14	22	0.005000	1.6	5.84	**131**	2	18	1.9	8	2.0	3.3	3.3	1.15	25,458	55	3	50	9
97.4 cfs	2,600	97.4	Earthen Ditch	0.004615	1.0	3.2	1.5	0.025	59.6	6	11	13	19	0.004615	1.5	5.26	**97**	2	17	1.7	8	2.0	3.3	3.3	1.15	24,756	53	3	50	9
53.8 cfs	2,600	53.8	Earthen Ditch	0.001923	1.0	3.0	1.5	0.025	59.6	5	10	12	16	0.001923	1.4	3.26	**54**	2	16	1.6	8	2.0	3.1	3.1	1.15	23,243	52	3	50	9
10 cfs	2,400	10.0	Earthen Ditch	0.000833	1.0	1.8	1.5	0.025	59.6	3	6	7	6	0.000833	0.9	1.57	**10**	2	12	0.9	8	2.0	2.0	2.0	1.15	13,734	43	2	50	8
30.2 cfs	2,500	30.2	Earthen Ditch	0.006400	1.0	1.8	1.5	0.025	59.6	3	6	8	7	0.006400	0.9	4.44	**30**	2	12	1.0	8	2.0	2.1	2.1	1.15	14,696	44	3	50	8
																										219,114	**49**	**31**		**95**
																										Total	**Average**	**Total**		**Total**

Peripheral Berms	Linear Feet	Berm Crest Width (ft)	Exterior Run/Rise Slope	Berm Height (ft)	Berm Volume (cy/ft)	Fluff Factor	Total width (external toe to toe, ft)	Total Volume of Earth Moved (cy)	Total width (external toe to toe, ft)	Permanent Area (acres)	Construction Corridor width (ft)	Construction Area (acres)
All berms on exterior of ponds	76,982	8	2.0	4	2.4	1.15	24.0	209,847	24	42	50	219
Pond Levees												
Interior terrace	2,200	1	2	3	0.8	1.15	13.0	1,968	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	1,800	1	2	3	0.8	1.15	13.0	1,610	13	1	13	1
Interior terrace	900	1	2	3	0.8	1.15	13.0	805	13	0	13	0
Interior terrace	500	1	2	3	0.8	1.15	13.0	447	13	0	13	0
Interior terrace	1,000	1	2	3	0.8	1.15	13.0	894	13	0	13	0
Interior terrace	1,700	1	2	3	0.8	1.15	13.0	1,521	13	1	13	1
Interior terrace	2,300	1	2	3	0.8	1.15	13.0	2,057	13	1	13	1
Interior terrace	2,900	1	2	3	0.8	1.15	13.0	2,594	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	2,000	1	2	3	0.8	1.15	13.0	1,789	13	1	13	1
Interior terrace	1,300	1	2	3	0.8	1.15	13.0	1,163	13	0	13	0
Interior terrace	700	1	2	3	0.8	1.15	13.0	626	13	0	13	0
Interior terrace	800	1	2	3	0.8	1.15	13.0	716	13	0	13	0
Interior terrace	1,200	1	2	3	0.8	1.15	13.0	1,073	13	0	13	0
Interior terrace	1,200	1	2	3	0.8	1.15	13.0	1,073	13	0	13	0
Interior terrace	1,200	1	2	3	0.8	1.15	13.0	1,073	13	0	13	0
Interior terrace	1,200	1	2	3	0.8	1.15	13.0	1,073	13	0	13	0
Interior terrace	700	1	2	3	0.8	1.15	13.0	626	13	0	13	0
Interior terrace	900	1	2	3	0.8	1.15	13.0	805	13	0	13	0
Interior terrace	1,700	1	2	3	0.8	1.15	13.0	1,521	13	1	13	1
Interior terrace	2,400	1	2	3	0.8	1.15	13.0	2,147	13	1	13	1
Interior terrace	2,900	1	2	3	0.8	1.15	13.0	2,594	13	1	13	1
Interior terrace	2,900	1	2	3	0.8	1.15	13.0	2,594	13	1	13	1
Interior terrace	2,900	1	2	3	0.8	1.15	13.0	2,594	13	1	13	1
Interior terrace	2,900	1	2	3	0.8	1.15	13.0	2,594	13	1	13	1
Interior terrace	1,700	1	2	3	0.8	1.15	13.0	1,521	13	1	13	1
Interior terrace	2,600	1	2	3	0.8	1.15	13.0	2,326	13	1	13	1
Interior terrace	2,600	1	2	3	0.8	1.15	13.0	2,326	13	1	13	1
Interior terrace	2,600	1	2	3	0.8	1.15	13.0	2,326	13	1	13	1
Interior terrace	2,600	1	2	3	0.8	1.15	13.0	2,326	13	1	13	1
Interior terrace	2,600	1	2	3	0.8	1.15	13.0	2,326	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,400	1	2	3	0.8	1.15	13.0	2,147	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	1,600	1	2	3	0.8	1.15	13.0	1,431	13	0	13	0
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	1,300	1	2	3	0.8	1.15	13.0	1,163	13	0	13	0
Interior terrace	1,400	1	2	3	0.8	1.15	13.0	1,252	13	0	13	0
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	2,900	1	2	3	0.8	1.15	13.0	2,594	13	1	13	1
Interior terrace	2,700	1	2	3	0.8	1.15	13.0	2,415	13	1	13	1
Interior terrace	800	1	2	3	0.8	1.15	13.0	716	13	0	13	0
Interior terrace	1,700	1	2	3	0.8	1.15	13.0	1,521	13	1	13	1
Interior terrace	2,500	1	2	3	0.8	1.15	13.0	2,236	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	2,300	1	2	3	0.8	1.15	13.0	2,057	13	1	13	1
Interior terrace	1,600	1	2	3	0.8	1.15	13.0	1,431	13	0	13	0
Interior terrace	900	1	2	3	0.8	1.15	13.0	805	13	0	13	0
Interior terrace	900	1	2	3	0.8	1.15	13.0	805	13	0	13	0
Interior terrace	6,500	1	2	3	0.8	1.15	13.0	5,814	13	2	13	2
Interior terrace	2,200	1	2	3	0.8	1.15	13.0	1,968	13	1	13	1
Interior terrace	3,000	1	2	3	0.8	1.15	13.0	2,683	13	1	13	1
Interior terrace	3,100	1	2	3	0.8	1.15	13.0	2,773	13	1	13	1
Interior terrace	3,100	1	2	3	0.8	1.15	13.0	2,773	13	1	13	1
Interior terrace	3,100	1	2	3	0.8	1.15	13.0	2,773	13	1	13	1
Interior terrace	2,300	1	2	3	0.8	1.15	13.0	2,057	13	1	13	1
Interior terrace	1,600	1	2	3	0.8	1.15	13.0	1,431	13	0	13	0
Interior terrace	900	1	2	3	0.8	1.15	13.0	805	13	0	13	0
TOTAL	**192,500**							**172,181**		**57**		**57**
Miles	36											
Tractor speed (mph)	3											

Hours to perform one pass	12							
Hours to perform 5 passes	61							
Days to complete levees	6							601,142
								428,961
Recharge Basin acreages from GIS								
21								
15								
18								
21								
24								
28								
31								
35								
32								
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11								
32								
43								
44								
18								
7								
14								
17								
18								
19								
16								
18								
16								
12								
5								
-57	less levees							
1,482	**Total**							
1	**Min**							
44	**Max**							
18	**Average**							

Appendix D

California Natural Diversity Database Records

Special-Status Wildlife and Plant Species with Potential to Occur in the Project Area and Vicinity

Ventura Fish and Wildlife Species List

Appendix D
Introduction

This appendix contains lists of special-status species with potential to be present in the vicinity of the proposed Antelope Valley Water Bank. The lists were derived from three sources:

1. The California Natural Diversity Database (CNDDB)
2. The Sacramento Office of the United States Fish and Wildlife Service (USFWS)
3. The Ventura Office of the USFWS

The CNDDB records search was conducted on October 11, 2005. The search included the Fairmont Butte, Little Butte, and Lake Hughes 7.5-minute U.S. Geological Survey (USGS) quadrangles, which encompass the Project area, as well as the surrounding Soledad Mountain, Rosamond, Willow Springs, Tylerhorse Canyon, Liebre Twins, Neenach School, Burnt Peak, Del Sur, Lancaster West, Sleepy Valley, Green Valley, and Warn Springs Mountain quadrangles.

The species list from the Sacramento Office of the USFWS was obtained on August 3, 2005, through an online database search. The list included federal endangered and threatened species that occur in or may be affected by projects in the Soledad Mountain, Rosamond, Willow Springs, Tylerhorse Canyon, Fairmont Butte, Little Buttes, Liebre Twins, and Neenach School quadrangles. This list from the Sacramento Office included only quadrangles located in Kern County.

The special-status plant and wildlife list from the Ventura Office of the USFWS was obtained on July 19, 2005, through an online database search. This list included federal endangered and threatened species that may be affected by projects in Los Angeles County.

Jones & Stokes biologists Will Kohn and Kate Carpenter conducted a reconnaissance field survey of the Project area on July 18, 2005, to obtain information about existing habitat conditions within and adjacent to the Project area. Will Kohn is a wildlife biologist with more than 9 years of experience conducting surveys for sensitive wildlife species throughout California; developing mitigation strategies; monitoring projects for compliance with

mitigation measures; and preparing Section 7 biological assessments and biological resource chapters for EIRs. Kate Carpenter is a Certified Arborist who specializes in special-status plant surveys, plant community characterization and mapping, wetland delineations, arborist surveys, floristic inventories, noxious weed surveys, and collecting and preparing voucher plant specimens.

Mr. Kohn and Ms. Carpenter used the information from attached lists and the results of the field surveys to develop tables of special-status plants species (Table 4.3-1) and special-status wildlife species (Table 4.3-2) that have the potential to occur in the Project area and vicinity. Tables 4.3-1 and Table 4.3-2 include only those special-status plant and wildlife species that actually could occur within the Project area based on their historical occurrences, the current range of those species, and current habitat conditions within and surrounding the Project area. It was these plant and wildlife species that were addressed in the Draft Environmental Impact Report.

Additionally, Mr. Kohn consulted with the California Department of Fish and Game (DFG) concerning the desert tortoise and Mohave ground squirrel. Ms. Annette Tennenbeau (Environmental Specialist for the Department of Fish and Game in the Fresno Office) was first contacted on February 6, 2006. Ms. Tennenbeau said that the current range for Mohave ground squirrel is east of State Route 14 but that surveys have not been conducted as far west as the Project area in some time. Ms. Tennenbeau suggested that Becky Jones, a DFG biologist in Lancaster, California, be contacted to discuss potential Project impacts on Mohave ground squirrels and desert tortoises. Ms. Jones was contacted on February 9, 2006, and referred Mr. Kohn to Scott Harris, a DFG biologist in Lancaster, California. Mr. Kohn spoke with Mr. Harris on February 9, 2006, about the current range of the Mohave ground squirrel and desert tortoise and the potential for Project impacts on these species. Mr. Harris said that that the Project area is outside of the current range of the Mohave ground squirrel and desert tortoise because much of the area west of State Route 14 has been heavily altered by the conversion of native habitat to agriculture. Mr. Harris thought that the likelihood of these species occurring in the Project area is very low, and he did not think that mitigation measures would be necessary to avoid impacts on the Mohave ground squirrel or desert tortoise. Accordingly, the Project area was not considered to be habitat for either species.

Agelaius tricolor

tricolored blackbird

Element Code: ABPBXB0020

Status — **Federal:** None; **State:** None

NDDB Element Ranks — **Global:** G2G3; **State:** S2

Other Lists — **CDFG Status:** SC

Habitat Associations

General: (NESTING COLONY) HIGHLY COLONIAL SPECIES, MOST NUMBEROUS IN CENTRAL VALLEY & VICINITY. LARGELY ENDEMIC TO CALIFORNIA.

Micro: REQUIRES OPEN WATER, PROTECTED NESTING SUBSTRATE, & FORAGING AREA WITH INSECT PREY WITHIN A FEW KM OF THE COLONY.

Occurrence No. 205 **Map Index:** 21591 **EO Index:** 8777

Dates Last Seen — **Element:** 1995-05-20; **Site:** 1995-05-20

*** SENSITIVE ***

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CHICHESTER, M. 1992 (OBS)

Record Last Updated: 2004-05-07

Quad Summary: ROSAMOND LAKE (3411871/186D), ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

*** SENSITIVE ***

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: FRESHWATER MARSH SURROUNDED BY SEMI-DESERT HABITAT. BIRDS NESTING IN CATTAILS. BIRDS FORAGING OVER A MILE AWAY IN FIELDS FOR RIGHT GREEN CATEPILLARS.

Owner/Manager:

Occurrence No. 400 **Map Index:** 55403 **EO Index:** 55403

Dates Last Seen — **Element:** 2000-04-22; **Site:** 2000-04-22

*** SENSITIVE ***

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: DFG 2004 (PERS)

Record Last Updated: 2004-05-10

Quad Summary: NEENACH SCHOOL (3411875/188D)
County Summary: LOS ANGELES

*** SENSITIVE ***

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: HABITAT IS 75% CATTAIL AND 25% BULRUSH. MUCH VEGETATION HAS BEEN CLEARED.

Owner/Manager:

Anniella pulchra pulchra

silvery legless lizard

Element Code: ARACC01012

Status — **Federal:** None; **State:** None

NDDB Element Ranks — **Global:** G3G4T3T4Q; **State:** S3

Other Lists — **CDFG Status:** SC

Habitat Associations

General: SANDY OR LOOSE LOAMY SOILS UNDER SPARSE VEGETATION.

Micro: SOIL MOISTURE IS ESSENTIAL. THEY PREFER SOILS WITH A HIGH MOISTURE CONTENT.

Occurrence No. 8 **Map Index:** 38704 **EO Index:** 33711

Dates Last Seen — **Element:** 1988-03-28; **Site:** 1988-03-28

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MULLEN, D. 1988 (PERS)

Record Last Updated: 1998-05-05

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.64328º / -118.16114º
UTM: Zone-11 N3834098 E393583
Radius: 1 mile
Elevation: 2,530 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 06N
Range: 12W
Section: 04 **Qtr:** XX
Meridian: S

Location: 6.4 KILOMETERS SSW OF LANCASTER (LOCATION DISTANCE TAKEN FROM LANCASTER POST OFFICE), NOT ABLE TO DETERMINE ACTUAL SITE.

Location Detail: LOCATION MAPPED AS A 1 MILE CIRCLE DUE TO NON-SPECIFIC DIRECTIONS.

General: ID VERIFIED BY LAWRENCE E. HUNT, SPECIMENS IN SANTA BARBARA VERTEBRATE MUSEUM (UCSBVM 21272-21274). PREVIOUSLY NOT KNOWN FROM DESERT FLOOR OF ANTELOPE VALLEY. PROBABLY REPRESENTS EASTERN LIMIT OF SPECIES, LIMITING CLIMATIC

Owner/Manager: UNKNOWN

Occurrence No. 9 **Map Index:** 38705 **EO Index:** 33712

Dates Last Seen — **Element:** 1988-01-22; **Site:** 1988-01-22

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MULLEN, D. 1988 (PERS)

Record Last Updated: 1998-05-05

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.69822º / -118.21855º
UTM: Zone-11 N3840253 E388395
Radius: 1 mile
Elevation: 2,345 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 13W
Section: 13 **Qtr:** XX
Meridian: S

Location: 7.2 KILOMETERS W OF LANCASTER, MIRA LOMA DETENTION FACILITY (LOCATION DISTANCE MEASURED FROM LANCASTER POST OFFICE).

Location Detail: LOCATION MAPPED AS A 1 MILE CIRCLE DUE TO NON-SPECIFIC DIRECTIONS, UNCERTAIN IF SPECIMEN WAS FOUND IN THE FACILITY.

General: JUVENILE CAPTURED & RELEASED. PREVIOUSLY NOT KNOWN FROM DESERT FLOOR OF ANTELOPE VALLEY. PROBABLY REPRESENTS EASTERN LIMIT OF SPECIES RANGE AS CLIMATIC CONDITIONS RAPIDLY BECOME LIMITING TO THE EAST IN THE MOJAVE DESERT.

Owner/Manager: UNKNOWN

Arenaria macradenia var. kuschei

Kusche's sandwort

Element Code: PDCAR040K4

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T2?
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: HABITAT LITTLE KNOWN.
Micro: MOJAVE DESERT. 1220M.

Occurrence No. 4 **Map Index:** 55943 **EO Index:** 55959

Dates Last Seen
Element: 1997-09-19
Site: 1997-09-19

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Main Source: WALL, M. 1997 (PERS)

Record Last Updated: 2004-06-30

Quad Summary: BURNT PEAK (3411865/163A)
County Summary: LOS ANGELES

Lat/Long: 34.70086º / -118.61595º
UTM: Zone-11 N3841059 E351999
Area: 17.2 ac
Elevation: 5,600 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 07N
Range: 16W
Section: 18 **Qtr:** NW
Meridian: S

Location: LIEBRE MOUNTAIN, ALONG THE FIREBREAK W OF ATMORE MEADOWS SPUR ROAD, S OF LIEBRE MOUNTAIN ROAD.

Location Detail: 3 COLONIES MAPPED IN THE NE 1/4 OF THE NW 1/4 OF SECTION 18 AND THE SW1/4 OF SE1/4 SEC 7.

Ecological: THIN SOILS WITH GRANITIC OUTCROPPINGS AND SPARSE VEGETATION DOMINATED BY LOW SHRUBS AND SUFFRUTICOSE PERENNIALS. WITH ERIOGONUM FASCICULATUM, ERIOPHYLLUM CONFERTIFLORUM, ERIASTRUM DENSIFOLIUM, AND LOTUS PROCUMBENS. DENSE CHAPARRAL NEARBY.

Threat: ORV ACTIVITY. FUELBREAK CONSTRUCTION. ROAD MAINTENANCE.

General: OVER 650 PLANTS SEEN IN 1997.

Owner/Manager: USFS-ANGELES NF

Occurrence No. 5 **Map Index:** 55944 **EO Index:** 55960

Dates Last Seen
Element: 1997-09-19
Site: 1997-09-19

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Main Source: WALL, M. 1997 (PERS)

Record Last Updated: 2004-06-30

Quad Summary: BURNT PEAK (3411865/163A)
County Summary: LOS ANGELES

Lat/Long: 34.70771º / -118.60527º
UTM: Zone-11 N3841803 E352990
Area: 4.9 ac
Elevation: 5,200 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 07N
Range: 16W
Section: 08 **Qtr:** SW
Meridian: S

Location: LIEBRE MOUNTAIN, JUST W OF THE INTERSECTION OF LIEBRE MOUNTAIN ROAD AND ATMORE MEADOWS SPUR ROAD.

Location Detail: ONE COLONY MAPPED AS ONE POLYGON IN THE NW 1/4 OF THE SW 1/4 OF SECTION 8.

Ecological: SPARSELY VEGETATED LOW SCRUB. WITH ERIOGONUM FASCICULATUM, ERIOPHYLLUM CONFERTIFLORUM, ERIASTRUM DENSIFOLIUM, LOTUS PROCUMBENS. DENSE CHAPARRAL NEARBY WITH QUERCUS CHRYSOLEPSIS, Q. WISLIZENII, ADENOSTOMA FASCICULATUM AND CEANOTHUS.

Threat: FUELBREAK CONSTRUCTION. ROAD MAINTENANCE.

General: ABOUT 20 PLANTS SEEN IN 1997.

Owner/Manager: USFS-ANGELES NF

Aspidoscelis tigris stejnegeri

coastal western whiptail

Element Code: ARACJ02143

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T3T4
State: S2S3

Other Lists
CDFG Status:

Habitat Associations
General: FOUND IN DESERTS & SEMIARID AREAS WITH SPARSE VEGETATION AND OPEN AREAS. ALSO FOUND IN WOODLAND & RIPARIAN AREAS.
Micro: GROUND MAY BE FIRM SOIL, SANDY, OR ROCKY.

Occurrence No. 62 **Map Index:** 54501 **EO Index:** 54501

Dates Last Seen
Element: 2003-06-06
Site: 2003-06-06
Record Last Updated: 2004-02-26

Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MESSETT, L. 2003 (OBS)

Quad Summary: WARM SPRINGS MOUNTAIN (3411855/163D)
County Summary: LOS ANGELES

Lat/Long: 34.56794º / -118.55767º
UTM: Zone-11 N3826233 E357109
Radius: 80 meters
Elevation: 2,000 ft
Mapping Precision SPECIFIC
Symbol Type: POINT
Township: 06N
Range: 16W
Section: 34 **Qtr:** XX
Meridian: S

Location: 0.4 MILE NE OF ELIZABETH LAKE, ANGELES NATIONAL FOREST

Ecological: HABITAT CONSISTS OF NORTHERN MIXED CHAPARRAL, DOMINATED BY YERBA SANTA, BUCKBRUSH, CHAMISE, AND BLACK SAGE. HARVESTER ANT COLONY IN THE VICINITY.

General: 1 ADULT OBSERVED ON 29 MAY 2003, IN AN UNPAVED TURNOUT AREA ALONG THE ROAD.

Owner/Manager: USFS-ANGELES NF

Aster greatae

Greata's aster

Element Code: PDAST0T1F0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.3

Other Lists
CNPS List: 1B
R-E-D Code: 2-1-3

Habitat Associations
General: CHAPARRAL, CISMONTANE WOODLAND.
Micro: MESIC CANYONS. 800-1500M.

Occurrence No. 40 **Map Index:** 59089 **EO Index:** 59125

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWIFT, I. #228 (HERB)

Dates Last Seen
Element: 2001-06-24
Site: 2001-06-24

Record Last Updated: 2005-01-04

Quad Summary: BURNT PEAK (3411865/163A), LIEBRE MTN. (3411866/163B)
County Summary: LOS ANGELES

Lat/Long: 34.63522º / -118.62625º
UTM: Zone-11 N3833795 E350938
Area: 49.9 ac
Elevation: 2,600 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON

Township: 06N
Range: 17W
Section: 01 **Qtr:** SE
Meridian: S

Location: LIEBRE MOUNTAINS, FISH CANYON, 2.0 MILES NORTH OF CIENEGA CAMPGROUND.

Location Detail: MAPPED APPROXIMATELY 2.0 MILES NORTH OF CIENEGA CAMPGROUND ALONG FISH CANYON, NEAR ELEVATION PROVIDED.

Ecological: ALONG STREAM IN RIPARIAN WOODLAND. ASSOCIATED WITH ALNUS RHOMBIFOLIA, SALIX LAEVIGATA, QUERCUS CHRYSOLEPIS, TYPHA LATIFOLIA, XANTHIUM STRUMARIUM, AND JUNCUS MICROPHYLLUS.

Owner/Manager: USFS-ANGELES NF

Astragalus preussii var. laxiflorus

Lancaster milk-vetch

Element Code: PDFAB0F721

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4T2T3
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-2

Habitat Associations
General: CHENOPOD SCRUB.
Micro: ALKALINE CLAY FLATS OR GRAVELLY OR SANDY WASHES AND ALONG DRAWS IN GULLIED BADLANDS. 725M IN CALIFORNIA.

Occurrence No. 1 **Map Index:** 27633 **EO Index:** 13967

Dates Last Seen
Element: 1902-06-XX
Site: 1902-06-XX

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: ELMER, A. #3669 POM #49666 (HERB)

Record Last Updated: 2002-07-01

Quad Summary: LANCASTER EAST (3411861/161A), LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.69828º / -118.13809º
UTM: Zone-11 N3840173 E395765
Radius: 1 mile
Elevation: 2,400 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 12W
Section: 15 **Qtr:** XX
Meridian: S

Location: LANCASTER, ANTELOPE VALLEY.

General: VICINITY REPORTED IN TWO COLLECTIONS; ELMER #3669 POM IN 1902 AND DAVIDSON SN RSA, UNDATED. SITE IS PROBABLY NO LONGER EXTANT ACCORDING TO LAPRE (1999).

Owner/Manager: UNKNOWN

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status — **Federal:** None; **State:** None

NDDB Element Ranks — **Global:** G4; **State:** S2

Other Lists — **CDFG Status:** SC

Habitat Associations

General: (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.

Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 166 **Map Index:** 23831 **EO Index:** 17755

Dates Last Seen — **Element:** 1993-06-28 **Site:** 1993-06-28

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Record Last Updated: 1993-07-20
Main Source: MALLORY, J. & I. ANDERSON 1993 (OBS)

Quad Summary: ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

Lat/Long: 34.79756º / -118.21941º
UTM: Zone-11 N3851271 E388450
Radius: 1/5 mile
Elevation: 2,360 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 13W
Section: 12 **Qtr:** SW
Meridian: S

Location: EAST SIDE OF 50TH STREET WEST, 0.5 MILE SOUTH OF WEST AVENUE B, 5 MILES SW OF ROSAMOND.

Location Detail: BURROW SITE LOCATED ALONG ROAD BETWEEN AGRICULTURAL FIELD AND SALTBUSH SCRUB HABITAT.

Ecological: HABITAT CONSISTS OF SALTBUSH SCRUB, SURROUNDED BY AGRICULTURAL FIELDS AND IRRIGATION RUN-OFF AREAS.

General: 10 FLEDGLINGS OBSERVED, SOME ROOSTING ON AN ATRIPLEX BUSH.

Owner/Manager: UNKNOWN

Occurrence No. 349 **Map Index:** 42488 **EO Index:** 42488

Dates Last Seen — **Element:** 1999-06-10 **Site:** 1999-06-10

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Record Last Updated: 2000-03-02
Main Source: HARRIS, S. 1999 (OBS)

Quad Summary: LITTLE BUTTES (3411873/187D)
County Summary: LOS ANGELES

Lat/Long: 34.80928º / -118.29868º
UTM: Zone-11 N3852661 E381215
Radius: 2/5 mile
Elevation: 2,445 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 13W
Section: 06 **Qtr:** XX
Meridian: S

Location: AVENUE B AT 95TH STREET WEST, ANTELOPE VALLEY.

Ecological: HABITAT CONSISTS OF OLD, FALLOW AGRICULTURAL FIELDS.

Threat: POSSIBLE THREAT OF DEVELOPMENT.

General: JUVENILE BIRD OBSERVED ON 10 JUN 1999, INDICATING AT LEAST ONE YOUNG FLEDGED.

Owner/Manager: UNKNOWN

Occurrence No. 350 **Map Index:** 42520 **EO Index:** 42520

Dates Last Seen — **Element:** 1999-06-27 **Site:** 1999-06-27

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Record Last Updated: 2000-07-12
Main Source: HARRIS, S. 1999 (OBS)

Quad Summary: NEENACH SCHOOL (3411875/188D)
County Summary: LOS ANGELES

Lat/Long: 34.80308º / -118.60715º
UTM: Zone-11 N3852383 E352987
Radius: 80 meters
Elevation: 2,910 ft
Mapping Precision SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 16W
Section: 08 **Qtr:** XX
Meridian: S

Location: SE OF THE INTERSECTION OF AVENUE B AND 270TH STREET WEST, ANTELOPE VALLEY.

Location Detail: BURROW IS LOCATED 20 FEET SOUTH OF THE INTERSECTION.

Ecological: HABITAT CONSISTS OF DESERT SCRUB AND OLD AGRICULTURAL FIELDS; A STAND OF JOSHUA TREES FOUND NEARBY.

General: MALE OBSERVED AT THE BURROW DURING APR & MAY, STARTING ON 16 APR 1999. FEMALE AND YOUNG OBSERVED ON 6 JUN 1999. 2 ADULTS AND 6 JUVENILES OBSERVED ON 27 JUN 1999.

Owner/Manager: PVT?

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4
State: S2

Other Lists
CDFG Status: SC

Habitat Associations
General: (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 351 **Map Index:** 42522 **EO Index:** 42522

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 1999 (OBS)

Dates Last Seen
Element: 1999-06-11
Site: 1999-06-11
Record Last Updated: 2000-03-13

Quad Summary: NEENACH SCHOOL (3411875/188D)
County Summary: LOS ANGELES

Lat/Long: 34.78435º / -118.57135º
UTM: Zone-11 N3850253 E356230
Radius: 2/5 mile
Elevation: 2,940 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 16W
Section: 15 **Qtr:** XX
Meridian: S

Location: 250TH STREET WEST, BETWEEN AVENUE C AND THE CALIFORNIA AQUEDUCT, ANTELOPE VALLEY
Ecological: HABITAT CONSISTS OF DESERT SCRUB AND OLD AGRICULTURAL FIELDS.
General: BURROW WITH FLEDGED YOUNG OBSERVED ON 11 JUN 1999.
Owner/Manager: UNKNOWN

Occurrence No. 352 **Map Index:** 42523 **EO Index:** 42523

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 1999 (OBS)

Dates Last Seen
Element: 1999-03-26
Site: 1999-03-26
Record Last Updated: 2000-03-13

Quad Summary: NEENACH SCHOOL (3411875/188D)
County Summary: LOS ANGELES

Lat/Long: 34.77728º / -118.58243º
UTM: Zone-11 N3849485 E355204
Radius: 1/5 mile
Elevation: 3,000 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 16W
Section: 16 **Qtr:** XX
Meridian: S

Location: NORTH OF AVENUE D, NEAR 256TH STREET WEST, ANTELOPE VALLEY.
Ecological: HABITAT CONSISTS OF DESERT SCRUB AND OLD AGRICULTURAL FIELDS.
General: OCCUPIED BURROW OBSERVED ON 26 MAR 1999.
Owner/Manager: UNKNOWN

Occurrence No. 358 **Map Index:** 42487 **EO Index:** 42487

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 1999 (OBS)

Dates Last Seen
Element: 1999-05-19
Site: 1999-05-19
Record Last Updated: 2000-10-10

Quad Summary: LITTLE BUTTES (3411873/187D)
County Summary: KERN, LOS ANGELES

Lat/Long: 34.81224º / -118.32617º
UTM: Zone-11 N3853023 E378705
Radius: 3/5 mile
Elevation: 2,485 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 14W
Section: 02 **Qtr:** XX
Meridian: S

Location: 110TH STREET WEST, BETWEEN AVENUE A AND AVENUE B, ANTELOPE VALLEY
Ecological: HABITAT CONSISTS OF OLD, FALLOW AGRICULTURAL FIELDS AND DESERT SCRUB.
General: ADULT BIRD OCCUPYING THIS TERRITORY ON 19 MAY 1999; PRESUMED NESTING.
Owner/Manager: UNKNOWN

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4
State: S2

Other Lists
CDFG Status: SC

Habitat Associations
General: (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.
Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 557 **Map Index:** 50574 **EO Index:** 50574

Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 2003 (OBS)

Dates Last Seen
Element: 2003-01-11
Site: 2003-01-11
Record Last Updated: 2003-03-12

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.67516º / -118.20192º
UTM: Zone-11 N3837677 E389888
Radius: 80 meters
Elevation: 2,365 ft
Mapping Precision SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 13W
Section: 24 **Qtr:** SE
Meridian: S

Location: NW CORNER OF THE INTERSECTION OF AVENUE K AND 40TH STREET WEST, LANCASTER
Ecological: HABITAT CONSISTS OF DISTURBED ALKALI SINK SCRUB/EXOTIC ANNUALS. SURROUNDING AREA CONSISTS OF RESIDENTIAL TO THE NORTH, EAST, AND WEST, AND DISTURBED JOSHUA TREE WOODLAND/ALKALI SCRUB TO THE SOUTH.
Threat: THREATENED BY ENCROACHING URBANIZATION AND DUMPING.
General: BREEDING OBSERVATIONS MADE DURING 2001. 1 BIRD OBSERVED DURING DEC 2002 (XMAS BIRD COUNT) AND AGAIN ON 11 JAN 2003.
Owner/Manager: PVT

Occurrence No. 586 **Map Index:** 51327 **EO Index:** 51327

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 2003 (OBS)

Dates Last Seen
Element: 2003-05-14
Site: 2003-05-14
Record Last Updated: 2003-05-20

Quad Summary: DEL SUR (3411863/162A)
County Summary: LOS ANGELES

Lat/Long: 34.70306º / -118.34132º
UTM: Zone-11 N3840933 E377158
Radius: 80 meters
Elevation: 2,540 ft
Mapping Precision SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 14W
Section: 14 **Qtr:** NW
Meridian: S

Location: JUST SE OF THE INTERSECTION OF AVENUE I AND 120TH STREET WEST, 4 MILES NE OF ELIZABETH LAKE
Location Detail: BURROW IS LOCATED ~50 FEET SOUTH OF THE SPEED SIGN ON AVENUE I.
Ecological: HABITAT CONSISTS OF A FALLOW FIELD WITH SHORT, ANNUAL HERBACEOUS GROWTH/ANNUAL WILDFLOWERS; GROUND SQUIRREL BURROWS FOUND IN THE FLAT AREA.
Threat: THREATENED BY AGRICULTURAL ACTIVITIES AND PROXIMITY TO A WELL-TRAVELED ROADWAY.
General: 2 ADULTS AND 6 YOUNG OBSERVED ON 11 MAY 2003; 1 AGITATED ADULT PRESENT AT THE SITE ON 14 MAY 2003.
Owner/Manager: PVT

Athene cunicularia

burrowing owl

Element Code: ABNSB10010

Status — **Federal:** None; **State:** None

NDDB Element Ranks — **Global:** G4; **State:** S2

Other Lists — **CDFG Status:** SC

Habitat Associations

General: (BURROW SITES) OPEN, DRY ANNUAL OR PERENIAL GRASSLANDS, DESERTS & SCRUBLANDS CHARACTERIZED BY LOW-GROWING VEGETATION.

Micro: SUBTERRANEAN NESTER, DEPENDENT UPON BURROWING MAMMALS, MOST NOTABLY, THE CALIFORNIA GROUND SQUIRREL.

Occurrence No. 710 **Map Index:** 56802 **EO Index:** 56818

Dates Last Seen — **Element:** 2004-09-03; **Site:** 2004-09-03

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 2004 (OBS)

Record Last Updated: 2004-09-15

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.67860º / -118.21146º
UTM: Zone-11 N3838069 E389018
Radius: 80 meters
Elevation: 2,370 ft

Mapping Precision SPECIFIC
Symbol Type: POINT

Township: 07N
Range: 13W
Section: 24 **Qtr:** SW
Meridian: S

Location: WEST SIDE OF 45TH AVENUE WEST, 0.3 MILE NORTH OF AVENUE K, 3.5 MILES WSW OF LANCASTER

Ecological: HABITAT CONSISTS OF DISTURBED FALLOW AGRICULTURAL FIELDS/SPARSE RUDERAL VEGETATION, WITH SCATTERED RUDERAL WOODY SCRUB; IRRIGATION PIPES PROVIDE BURROW SITE AVAILABILITY.

Threat: THREATENED BY ONGOING DEVELOPMENT ON LAND SURROUNDING THIS SITE.

General: 3 INDIVIUALS/BURROWS OBSERVED ON 3 SEP 2004

Owner/Manager: PVT

Berberis nevinii

Nevin's barberry

Element Code: PDBER060A0

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: CHAPARRAL, CISMONTANE WOODLAND, COASTAL SCRUB, RIPARIAN SCRUB.
Micro: ON STEEP, N-FACING SLOPES OR IN LOW GRADE SANDY WASHES. 290-1575M.

Occurrence No. 11 **Map Index:** 01154 **EO Index:** 21582

Occ Rank: Good
Origin: Introduced Back into Native Hab./Range
Presence: Presumed Extant
Trend: Increasing
Main Source: NISHIDA, J. 1987 (OBS)

Dates Last Seen
Element: 1988-10-24
Site: 1988-10-24
Record Last Updated: 2002-02-11

Quad Summary: WARM SPRINGS MOUNTAIN (3411855/163D)
County Summary: LOS ANGELES

Lat/Long: 34.53252º / -118.52613º
UTM: Zone-11 N3822260 E359944
Area: 14.6 ac
Elevation: 1,500 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 05N
Range: 16W
Section: 11 **Qtr:** NE
Meridian: S

Location: SAN FRANCISQUITO CANYON, ON BOTH SIDES OF HIGHWAY, BELOW POWERHOUSE #2, NORTH OF SAUGUS.
Location Detail: WEST AND SOUTH OF THE FOREST SERVICE FIRE STATION.
Ecological: ON ROCKY, GRAVELLY CLIFFS AND WASH BOTTOM IN CHAPARRAL WITH COAST LIVE OAK, BLACK SAGE. MOSTLY IN NORTHWEST FACING SLOPES.
Threat: DUMPINGS, INVASION BY TAMARISK, ROAD WIDENINGS, AND GOLD EXTRACTION ACTIVITIES ARE THREATS.
General: 75 SEEDLINGS SEEN IN 1986, 130+ PLANTS IN 1987, 200 PLANTS OBSERVED IN 1988. BERBERIS PLANTED HERE IN 1929 BY PAYNE, MAY HAVE NATURALIZED AT THIS SITE.
Owner/Manager: USFS-ANGELES NF

Occurrence No. 19 **Map Index:** 01165 **EO Index:** 21574

Occ Rank: Poor
Origin: Introduced Back into Native Hab./Range
Presence: Presumed Extant
Trend: Unknown
Main Source: CODHRANE, S. 1985 (OBS)

Dates Last Seen
Element: 1985-11-13
Site: 1985-11-13
Record Last Updated: 2002-02-11

Quad Summary: WARM SPRINGS MOUNTAIN (3411855/163D)
County Summary: LOS ANGELES

Lat/Long: 34.53880º / -118.52358º
UTM: Zone-11 N3822953 E360189
Area: 1.5 ac
Elevation: 1,680 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 05N
Range: 16W
Section: 11 **Qtr:** NE
Meridian: S

Location: APPROX 0.5 MI N SAN FRANSQUITO POWERHOUSE, SAN FRANCISQUITO CYN.
Location Detail: NW 1/4 OF NE1/4 OF SEC 11.
Ecological: ON ALLUVIAL TERRACE ASSOCIATED WITH ERIODICTYON SP, PRUNUS ILICIFOLIA, YUCCA.
General: 1 MATURE PLANT. NEW HIGHWAY CONSTRUCTION BY LA COUNTY ROAD DEPARTMENT PROPOSED AND FLAGGING NEARBY. GOOD HABITAT, BUT ONLY 1 PLANT. PAYNE PLANTED BERBERIS NEVINII IN THIS VICINTY IN 1929.
Owner/Manager: USFS-ANGELES NF

Buteo swainsoni

Swainson's hawk

Element Code: ABNKC19070

Status
Federal: None
State: Threatened

NDDB Element Ranks
Global: G5
State: S2

Other Lists
CDFG Status:

Habitat Associations
General: (NESTING) BREEDS IN STANDS WITH FEW TREES IN JUNIPER-SAGE FLATS, RIPARIAN AREAS AND IN OAK SAVANNAH.
Micro: REQUIRES ADJACENT SUITABLE FORAGING AREAS SUCH AS GRASSLANDS, OR ALFALFA OR GRAIN FIELDS SUPPORTING RODENT POPULATIONS.

Occurrence No. 802 **Map Index:** 42484 **EO Index:** 42484

Dates Last Seen
Element: 1995-07-04
Site: 1995-07-04
Record Last Updated: 2000-03-02

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 1995 (OBS)

Quad Summary: LITTLE BUTTES (3411873/187D)
County Summary: KERN

Lat/Long: 34.82645º / -118.30778º
UTM: Zone-11 N3854577 E380408
Radius: 1/10 mile
Elevation: 2,455 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 09N
Range: 13W
Section: 31 **Qtr:** SW
Meridian: S

Location: EAST SIDE OF 100TH STREET WEST, 0.45 MILE NORTH OF AVENUE A, ANTELOPE VALLEY.
Ecological: HABITAT CONSISTS OF ACTIVE ALFALFA FIELDS AND FALLOW AGRICULTURAL FIELDS.
Threat: THREATENED BY HUMAN DISTURBANCES (VEHICLES, SHOOTING).
General: NEST WITH BOTH ADULTS AND 1 DOWNY YOUNG OBSERVED ON 4 JUL 1995.
Owner/Manager: UNKNOWN

Occurrence No. 803 **Map Index:** 42486 **EO Index:** 42486

Dates Last Seen
Element: 1999-07-01
Site: 1999-07-01
Record Last Updated: 2000-03-02

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 1999 (OBS)

Quad Summary: LITTLE BUTTES (3411873/187D)
County Summary: KERN, LOS ANGELES

Lat/Long: 34.81815º / -118.31677º
UTM: Zone-11 N3853667 E379573
Radius: 2/5 mile
Elevation: 2,400 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 14W
Section: 01 **Qtr:** XX
Meridian: S

Location: SOUTH OF AVENUE A, APPROXIMATELY 1.5 MILES WEST OF 90TH STREET WEST, ANTELOPE VALLEY
Ecological: HABITAT CONSISTS OF OLD, FALLOW AGRICULTURAL FIELDS, OVERGROWN WITH RUDERAL VEGETATION.
General: ON 1 JUL 1999, A PAIR OF BIRDS EXHIBITED AGITATION NEAR A PRESUMED NEST TREE, AND ONE BIRD KEPT FLYING INTO A DENSE PORTION OF THE TREE, WHICH APPEARED TO CONTAIN A NEST.
Owner/Manager: UNKNOWN

Calochortus clavatus var. gracilis

slender mariposa lily

Element Code: PMLIL0D096

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4T1
State: S1.1?

Other Lists
CNPS List: 1B
R-E-D Code: 3-2-3

Habitat Associations
General: CHAPARRAL, COASTAL SCRUB.
Micro: SHADED FOOTHILL CANYONS; OFTEN ON GRASSY SLOPES WITHIN OTHER HABITAT. 420-760M

Occurrence No. 4 **Map Index:** 26507 **EO Index:** 1660

Dates Last Seen
Element: 1922-06-12
Site: 1922-06-12

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: OWNBEY, M. 1940 (LIT)

Record Last Updated: 1995-11-27

Quad Summary: GREEN VALLEY (3411854/162C)
County Summary: LOS ANGELES

Lat/Long: 34.58922º / -118.45295º
UTM: Zone-11 N3828449 E366751
Radius: 2/5 mile
Elevation: 2,200 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 06N
Range: 15W
Section: XX **Qtr:** XX
Meridian: S

Location: SAN FRANCISQUITO CANYON, NEAR POWER PLANT NO. 1.
Location Detail: MAPPED NEAR CONFLUENCE OF CLEARWATER CANYON AND SAN FRANCISQUITO CANYON.
General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1922 COLLECTION BY MOXLEY #1113 (RM). COLLECTION CITED IN OWNBEY'S 1940 "MONOGRAPH OF CALOCHORTUS" IN ANNALS OF THE MISSOURI BOTANICAL GARDEN.
Owner/Manager: UNKNOWN

Calochortus striatus

alkali mariposa lily

Element Code: PMLIL0D190

Status — **Federal:** None **State:** None

NDDB Element Ranks — **Global:** G2 **State:** S2.2

Other Lists — **CNPS List:** 1B **R-E-D Code:** 2-2-2

Habitat Associations

General: CHAPARRAL, CHENOPOD SCRUB, MOJAVEAN DESERT SCRUB, MEADOWS.

Micro: ALKALINE MEADOWS AND EPHEMERAL WASHES. 90-1595M.

Occurrence No. 20 **Map Index:** 02182 **EO Index:** 22106

Dates Last Seen — **Element:** 1995-05-21 **Site:** 1995-05-21

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. AIR FORCE 1984 (MAP)
Record Last Updated: 2002-08-08

Quad Summary: ROSAMOND LAKE (3411871/186D), ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

Lat/Long: 34.79112º / -118.13424º
UTM: Zone-11 N3850465 E396234
Area: 121.6 ac
Elevation: 2,290 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 08N **Range:** 12W **Section:** 15 **Qtr:** NE **Meridian:** S

Location: JUNCTION OF WEST AVE & DIVISION STREET - EDWARDS AFB.

Location Detail: THREE POLYGONS MAPPED WEST OF PIUTE PONDS.

Ecological: IN HALOPHYTIC PHASE SALTBUSH SCRUB.

Threat: LITTER AND SMALL AMOUNTS OF TRASH DUMPING ADJACENT TO ROAD. MILITARY OPERATIONS MAY THREATEN.

General: FEW DOZEN PLANTS SEEN IN 1978, 26 PLANTS COUNTED IN 1988, BUT MANY MORE SEEN. IN 1995 2633 PLANTS OBSERVED OVER 43 HECTARES.

Owner/Manager: DOD-EDWARDS AFB

Occurrence No. 21 **Map Index:** 02168 **EO Index:** 22108

Dates Last Seen — **Element:** 1988-05-01 **Site:** 1988-05-01

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. AIR FORCE 1984 (MAP)
Record Last Updated: 1995-11-15

Quad Summary: ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

Lat/Long: 34.81275º / -118.13896º
UTM: Zone-11 N3852869 E395829
Radius: 1/5 mile
Elevation: 2,295 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N **Range:** 12W **Section:** 03 **Qtr:** SE **Meridian:** S

Location: 0.5 MI W OF DIVISION ST & 0.5 MI N OF WEST AVE - EDWARDS AFB.

General: FEW DOZEN PLANTS SEEN IN 1978, 289 SEEN IN 1988.

Owner/Manager: DOD-EDWARDS AFB

Occurrence No. 23 **Map Index:** 02152 **EO Index:** 29484

Dates Last Seen — **Element:** 2000-05-17 **Site:** 2000-05-17

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BROWN, L. ET AL 1995 (OBS)
Record Last Updated: 2002-06-06

Quad Summary: LANCASTER WEST (3411862/161B), ROSAMOND (3411872/186C)
County Summary: KERN, LOS ANGELES

Lat/Long: 34.77934º / -118.14915º
UTM: Zone-11 N3849174 E394855
Area: 773.2 ac
Elevation: 2,310 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 08N **Range:** 12W **Section:** 16 **Qtr:** E **Meridian:** S

Location: ALONG THE SIERRA HIGHWAY NORTH OF LANCASTER, FROM JUST SOUTH OF AVENUE G NORTH PAST PATTERSON ROAD.

Location Detail: FREQUENT FOR ABOUT 8 MILES ALONG THE HIGHWAY, MOSTLY ALONG THE EAST SIDE OF THE SOUTHERN PACIFIC RAIL ROAD RIGHT OF WAY, WITH A FEW PLANTS TO THE WEST. ALSO FOUND ALONG AT&T RIGHT-OF-WAY (10TH STREET) FROM PATTERSON ROAD TO AVENUE G.

Ecological: FOUND ON SILT/CAKED MUD, IN OPEN SPACES BETWEEN SHRUBS AND ON EDGES OF SALT PANS AND MINI ALKALI PLAYAS. ASSOCIATED WITH ANNUAL GRASSES, ATRIPLEX CANESCENS, CHRYSOTHAMNUS NAUSEOSUS, DISTICHLIS SPICATA, LASTHENIA CALIFORNICA, AND WEEDY SPP.

Threat: MOSTLY IN ROAD AND RR RIGHT OF WAY, SOME GRADING AND TRASH DUMPING, POSSIBLE DEVELOPMENT.

General: THOUSANDS OF PLANTS IN 1995. LEAVES OF SEVERAL HUNDRED PLANTS FREQUENT IN GROUPS. INCLUDES FORMER OCCURRENCE #24. 2500 PLANTS IN SMALL CLUMPS IN 1998 ALONG AT&T R-O-W. 25+ PLANTS IN 2000 AT SIERA HWY & AVE G AND 100+ ALONG AT&T R-O-W.

Calochortus striatus

alkali mariposa lily

Element Code: PMLIL0D190

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-2

Habitat Associations
General: CHAPARRAL, CHENOPOD SCRUB, MOJAVEAN DESERT SCRUB, MEADOWS.
Micro: ALKALINE MEADOWS AND EPHEMERAL WASHES. 90-1595M.

Owner/Manager: PVT, AT&T

Occurrence No. 39 **Map Index:** 24272 **EO Index:** 7179

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VILLASENOR, R. 1988 (OBS)

Dates Last Seen
Element: 1988-06-05
Site: 1988-06-05
Record Last Updated: 1993-10-13

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.69047º / -118.22484º
UTM: Zone-11 N3839401 E387809
Area: 117.8 ac
Elevation: 2,340 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 07N
Range: 13W
Section: 14 **Qtr:** S
Meridian: S

Location: ANTELOPE VALLEY; JUST SOUTH OF THE MIRA LOMA DETENTION CENTER, WEST OF LANCASTER.

Location Detail: LOCATED BETWEEN 50TH AND 60TH STREETS AND ALONG EITHER SIDE OF AVENUE J.

Ecological: SHADSCALE SCRUB ON ALKALI SOILS. ASSOCIATES INCLUDE ATRIPLEX CONFERTIFOLIA, CHRYSOTHAMNUS, EPHEDRA, LYCIUM, AND CHORIZANTHE SPINOSA.

Threat: TWO CONSTRUCTION PROJECTS TARGETED FOR THIS SITE; MIRA LOMA BOYS CAMP AND NEW L.A. COUNTY PRISON.

General: APPROX. 200 PLANTS OBSERVED IN 1988. ONLY 15% OF POPULATION FLOWERED, DUE IN PART TO APPARENT GRAZING (RABBITS?). NO ADDITIONAL INFORMATION ON THE STATUS OF THIS SITE SINCE 1988, NEEDS FIELDWORK.

Owner/Manager: LAX COUNTY?

Occurrence No. 40 **Map Index:** 28333 **EO Index:** 29485

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BROWN, L. & M. DUNGEN 1995 (OBS)

Dates Last Seen
Element: 1995-05-12
Site: 1995-05-12
Record Last Updated: 1996-10-03

Quad Summary: SOLEDAD MTN. (3411882/186B)
County Summary: KERN

Lat/Long: 34.94445º / -118.14872º
UTM: Zone-11 N3867485 E395104
Area: 62.4 ac
Elevation: 2,555 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 10N
Range: 12W
Section: 22 **Qtr:** W
Meridian: S

Location: SIERRA HIGHWAY BETWEEN SOPP ROAD AND BACKUS ROAD, SOUTH OF ACTIS AND SOUTHEAST OF SOLEDAD MOUNTAIN.

Location Detail: EAST OF HIGHWAY, ALONG BOTH SIDES OF SPRR TRACKS.

Ecological: FOUND ON SILT/CAKED MUD, IN OPEN SPACES BETWEEN SHRUBS AND ON EDGES OF SALT PANS AND MINI ALKALI PLAYAS. ASSOCIATED WITH ANNUAL GRASSES, ATRIPLEX CANESCENS, CHRYSOTHAMNUS NAUSEOSUS, DISTICHLIS SPICATA, LASTHENIA CALIFORNICA, AND WEEDY SPP.

Threat: THREATENED BY ACTIVITY WITHIN ROAD AND RR RIGHT OF WAY AS WELL AS UTILITY CORRIDOR.

General: ABOUT 100 PLANTS OBSERVED IN 1995.

Owner/Manager: PVT

Calochortus striatus

alkali mariposa lily

Element Code: PMLIL0D190

Status — **Federal:** None; **State:** None

NDDB Element Ranks — **Global:** G2; **State:** S2.2

Other Lists — **CNPS List:** 1B; **R-E-D Code:** 2-2-2

Habitat Associations

General: CHAPARRAL, CHENOPOD SCRUB, MOJAVEAN DESERT SCRUB, MEADOWS.

Micro: ALKALINE MEADOWS AND EPHEMERAL WASHES. 90-1595M.

Occurrence No. 43 **Map Index:** 48060 **EO Index:** 48060

Dates Last Seen — **Element:** 1998-06-16; **Site:** 1998-06-16

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWIFT, I. 1998 (OBS)

Record Last Updated: 2002-06-06

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.74475º / -118.24057º
UTM: Zone-11 N3845438 E386442
Area: 41.9 ac
Elevation: 2,360 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON
Township: 08N
Range: 13W
Section: 34 **Qtr:** NE
Meridian: S

Location: WEST OF GENERAL WILLIAMS J. FOX AIRFIELD, ABOUT 3 MILES NORTH OF MIRA LOMA DETENTION CENTER, NORTHWEST OF LANCASTER.

Location Detail: MAPPED WITHIN THE NE 1/4 OF THE N1/4 OF SECTION 22.

Ecological: IN CHENOPOD SCRUB WITH ATRIPLEX HYMENOLYTRA, A. POLYCARPA, AND A. CONFERTIFOLIA. ON FLAT MUD-FLTA OPEN AREA WITH OCCASIONAL MOUNDS OF VEGETATION.

Threat: ROAD USE, AGRICULTURE.

General: MORE THAN 30 HEALTHY PLANTS OBSERVED IN 1998.

Owner/Manager: LAX COUNTY, DPR

Occurrence No. 45 **Map Index:** 48064 **EO Index:** 48064

Dates Last Seen — **Element:** 1988-XX-XX; **Site:** 1988-XX-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LAPRE & CAMPBELL SN UCR (HERB)

Record Last Updated: 2002-06-06

Quad Summary: ROSAMOND (3411872/186C)
County Summary: KERN

Lat/Long: 34.84534º / -118.16706º
UTM: Zone-11 N3856513 E393301
Radius: 1/10 mile
Elevation: 2,320 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 09N
Range: 12W
Section: 28 **Qtr:** NW
Meridian: S

Location: ROSAMOND, EAST SIDE OF 20TH STREET WEST, 0.3 MILE SOUTH OF MARIE AVENUE.

Location Detail: MAPPED ALONG 20TH STREET WEST, 0.3 MILE SOUTH OF MARIE AVENUE.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1988.

Owner/Manager: UNKNOWN

Occurrence No. 77 **Map Index:** 48503 **EO Index:** 48503

Dates Last Seen — **Element:** 1995-05-22; **Site:** 1995-05-22

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TETRA TECH 1995 (LIT)

Record Last Updated: 2002-08-08

Quad Summary: ROSAMOND LAKE (3411871/186D), ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

Lat/Long: 34.76959º / -118.12255º
UTM: Zone-11 N3848065 E397276
Area: 183.7 ac
Elevation: 2,290 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 08N
Range: 12W
Section: 23 **Qtr:** XX
Meridian: S

Location: SOUTH OF WESTERN PIUTE PONDS, NORTH OF EAST AVENUE E BETWEEN DIVISION STREET AND 10TH AVE EAST, SOUTH OF ROSAMOND LAKE.

Location Detail: 5 POLYGONS MAPPED MOSTLY WITHIN SECTION 23.

Ecological: IN HALOPHYTIC PHASE SALTBUSH SCRUB.

Threat: MILITARY OPERATIONS MAY THREATEN.

General: IN 1995 8486 PLANTS OBSERVED OVER 40 HECTARES.

Owner/Manager: DOD-EDWARDS AFB

Calochortus striatus

alkali mariposa lily

Element Code: PMLIL0D190

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-2

Habitat Associations
General: CHAPARRAL, CHENOPOD SCRUB, MOJAVEAN DESERT SCRUB, MEADOWS.
Micro: ALKALINE MEADOWS AND EPHEMERAL WASHES. 90-1595M.

Occurrence No. 78 **Map Index:** 48501 **EO Index:** 48501

Dates Last Seen
Element: 1995-05-12
Site: 1995-05-12
Record Last Updated: 2002-08-13

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TETRA TECH 1995 (LIT)

Quad Summary: ROSAMOND LAKE (3411871/186D), ROSAMOND (3411872/186C)
County Summary: KERN

Lat/Long: 34.84344º / -118.13809º
UTM: Zone-11 N3856272 E395947
Area: 51.0 ac
Elevation: 2,290 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 09N
Range: 12W
Section: 27 **Qtr:** E
Meridian: S

Location: 2 MILES SOUTHEAST OF ROSAMOND, EAST OF HIGHWAY 14 AND SOUTH OF ROSAMOND BLVD, EDWARDS AIR FORCE BASE.
Location Detail: 8 POLYGONS LOCATED EAST OF SEWAGE DISPOSAL PONDS AND PIPELINE. MAPPED WITHIN THE S 1/2 OF THE SW 1/4 OF SECTION 23, THE SW 1/4 OF THE SW 1/4 OF SECTION 26, AND THE E 1/2 OF SECTION 27.
Ecological: IN HALOPHYTIC PHASE SALTBUSH SCRUB.
Threat: MILITARY OPERATIONS MAY THREATEN.
General: IN 1995 63,799 PLANTS OBSERVED BETWEEN THIS OCCURRENCE AND OCCURRENCE #79.
Owner/Manager: DOD-EDWARDS AFB

Occurrence No. 79 **Map Index:** 48505 **EO Index:** 48505

Dates Last Seen
Element: 1995-XX-XX
Site: 1995-XX-XX
Record Last Updated: 2002-08-08

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TETRA TECH 1995 (LIT)

Quad Summary: ROSAMOND (3411872/186C)
County Summary: KERN, LOS ANGELES

Lat/Long: 34.82108º / -118.13358º
UTM: Zone-11 N3853787 E396331
Area: 96.8 ac
Elevation: 2,290 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 09N
Range: 12W
Section: 34 **Qtr:** SE
Meridian: S

Location: ALONG DIVISION STREET 0.3 MILE NORTH TO 0.8 MILE SOUTH OF KERN/LA COUNTY LINE, EAST OF HIGHWAY 14, SSE OF ROSAMOND.
Location Detail: MAPPED MOSTLY WITHIN THE SE 1/4 OF SECTION 34 AND THE NE 1/4 OF SECTION 3.
Ecological: IN HALOPHYTIC PHASE SALTBUSH SCRUB.
Threat: MILITARY OPERATIONS MAY THREATEN.
General: IN 1995 63,799 PLANTS OBSERVED BETWEEN THIS OCCURRENCE AND OCCURRENCE #78.
Owner/Manager: DOD-EDWARDS AFB

Calochortus striatus

alkali mariposa lily

Element Code: PMLIL0D190

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-2

Habitat Associations
General: CHAPARRAL, CHENOPOD SCRUB, MOJAVEAN DESERT SCRUB, MEADOWS.
Micro: ALKALINE MEADOWS AND EPHEMERAL WASHES. 90-1595M.

Occurrence No. 85 **Map Index:** 48544 **EO Index:** 48544

Dates Last Seen
Element: 1995-05-22
Site: 1995-05-22

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TETRA TECH 1995 (LIT)

Record Last Updated: 2002-08-13

Quad Summary: SOLEDAD MTN. (3411882/186B)
County Summary: KERN

Lat/Long: 34.94936º / -118.12969º
UTM: Zone-11 N3868010 E396847
Area: 20.6 ac
Elevation: 2,510 ft

Mapping Precision SPECIFIC
Symbol Type: POLYGON

Township: 10N
Range: 12W
Section: 23 **Qtr:** NW
Meridian: S

Location: EAST OF HIGHWAY 14, 1.3 MILES ESE OF ACTIS, EDWARDS AIR FORCE BASE.
Location Detail: MAPPED WITHIN THE NW 1/4 OF THE NW 1/4 OF SECTION 23.
Ecological: IN HALOPHYTIC PHASE SALTBUSH SCRUB.
Threat: MILITARY OPERATIONS MAY THREATEN.
General: IN 1995 3779 PLANTS OBSERVED OVER 8 HECTARES.
Owner/Manager: DOD-EDWARDS AFB

Charadrius montanus

mountain plover

Element Code: ABNNB03100

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2?

Other Lists
CDFG Status: SC

Habitat Associations
General: (WINTERING) SHORT GRASSLANDS, FRESHLY PLOWED FIELDS, NEWLY SPROUTING GRAIN FIELDS, & SOMETIMES SOD FARMS
Micro: SHORT VEGETATION, BARE GROUND & FLAT TOPOGRAPHY. PREFER GRAZED AREAS & AREAS WITH BURROWING RODENTS.

Occurrence No. 9 **Map Index:** 41848 **EO Index:** 41848

Dates Last Seen
Element: 1999-03-12
Site: 1999-03-12
Record Last Updated: 1999-11-09

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. 1999 (OBS)

Quad Summary: LITTLE BUTTES (3411873/187D)
County Summary: LOS ANGELES

Lat/Long: 34.78775º / -118.34465º
UTM: Zone-11 N3850329 E376978
Radius: 1/10 mile
Elevation: 2,510 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 14W
Section: 15 **Qtr:** NE
Meridian: S

Location: WEST SIDE OF 120TH STREET WEST, 0.8 MILE NORTH OF AVENUE D, 3 MILES NW OF ANTELOPE ACRES.

Ecological: HABITAT CONSISTS OF A SPARSE, OPEN FIELD, WITH LOW RUDERAL GROWTH; SURROUNDED BY AGRICULTURAL FIELDS. HORNED LARKS OBSERVED UTILIZING THE SAME FIELD.

General: 24 INDIVIDUALS OBSERVED WINTERING ON 12 MAR 1999.

Owner/Manager: UNKNOWN

Chorizanthe parryi var. fernandina

San Fernando Valley spineflower

Element Code: PDPGN040J1

Status
Federal: Candidate
State: Endangered

NDDB Element Ranks
Global: G2T1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: COASTAL SCRUB.
Micro: SANDY SOILS. 3-1035M.

Occurrence No. 2 **Map Index:** 01640 **EO Index:** 21126

Dates Last Seen
Element: 1929-05-21
Site: 199X-XX-XX

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: HOFFMANN, R. SN SBM (HERB)

Record Last Updated: 2002-07-11

Quad Summary: LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

Lat/Long: 34.66387º / -118.40396º
UTM: Zone-11 N3836665 E371359
Radius: 1 mile
Elevation: 3,400 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 14W
Section: 30 **Qtr:** XX
Meridian: S

Location: ELIZABETH LAKE.
Location Detail: MAPPED AT ELIZABETH LAKE IN THE ANGELES NATIONAL FOREST.
Ecological: FOUND ON SANDY BANKS.
General: 3 COLLECTIONS FROM THIS VICINITY; HOFFMAN SN IN 1928 & 1929, AND UNDATED COLLECTION BY H. HALL #7396. NEEDS FIELDWORK. NO INDIVIDUALS LOCATED DURING SURVEYS IN THIS AREA OVER THE LAST TEN YEARS, DESPITE THE PRESENCE OF SUITABLE HABITAT.
Owner/Manager: UNKNOWN

Occurrence No. 5 **Map Index:** 41261 **EO Index:** 41261

Dates Last Seen
Element: 1929-04-27
Site: 1929-04-27

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: HOFFMANN, R. SN SBM (HERB)

Record Last Updated: 2002-07-11

Quad Summary: NEWHALL (3411845/138A), VAL VERDE (3411846/138B), WARM SPRINGS MOUNTAIN (3411855/163D), WHITAKER PEAK (3411856/163C)
County Summary: LOS ANGELES

Lat/Long: 34.49010º / -118.62176º
UTM: Zone-11 N3817693 E351092
Radius: 1 mile
Elevation: 1,200 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 05N
Range: 17W
Section: 25 **Qtr:** XX
Meridian: S

Location: NEAR CASTAIC.
Location Detail: MAPPED ALONG CASTAIC VALLEY IN VICINITY OF CASTAIC.
Ecological: SANDY WASH.
General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1929 COLLECTION BY R. HOFFMAN. NEEDS FIELDWORK. MUCH OF SUITABLE HABITAT IN THIS AREA HAS BEEN DEVELOPED.
Owner/Manager: UNKNOWN

Chorizanthe parryi var. parryi

Parry's spineflower

Element Code: PDPGN040J2

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2T2
State: S2.1

Other Lists
CNPS List: 3
R-E-D Code: ?-2-3

Habitat Associations
General: COASTAL SCRUB, CHAPARRAL.
Micro: DRY SLOPES AND FLATS; SOMETIMES AT INTERFACE OF 2 VEG TYPES, SUCH AS CHAP AND OAK WDLAND; DRY, SANDY SOILS. 40-1705M.

Occurrence No. 38 **Map Index:** 42078 **EO Index:** 42078

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: DAVIDSON, A. SN UC #52602 (HERB)

Dates Last Seen
Element: 1896-06-XX
Site: 1896-06-XX
Record Last Updated: 1999-12-23

Quad Summary: LANCASTER EAST (3411861/161A), LANCASTER WEST (3411862/161B), ROSAMOND LAKE (3411871/186D), ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

Lat/Long: 34.69883º / -118.13787º
UTM: Zone-11 N3840234 E395785
Radius: 5 mile
Elevation: 2,350 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 12W
Section: 15 **Qtr:** XX
Meridian: S

Location: LANCASTER.
Location Detail: EXACT LOCATION NOT KNOWN; MAPPED IN GENERAL VICINITY OF LANCASTER.
General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1892 COLLECTION BY A. DAVIDSON.
Owner/Manager: UNKNOWN

Chorizanthe xanti var. leucotheca

white-bracted spineflower

Element Code: PDPGN040Z1

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4T3
State: S1S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: MOJAVE DESERT SCRUB, PINYON JUNIPER WOODLAND.
Micro: 300-1200M.

Occurrence No. 15 **Map Index:** 56628 **EO Index:** 56644

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: REISNER, C. SN SD (HERB)

Dates Last Seen
Element: 1990-05-16
Site: 1990-05-16
Record Last Updated: 2004-09-08

Quad Summary: SLEEPY VALLEY (3411853/162D)
County Summary: LOS ANGELES

Lat/Long: 34.60689º / -118.25855º
UTM: Zone-11 N3830170 E384604
Radius: 2/5 mile
Elevation: 3,100 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 06N
Range: 13W
Section: 16 **Qtr:** XX
Meridian: S

Location: RITTER RANCH N OF PALMDALE.
Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF THE RITTER RANCH, 0.7 MILES SE OF THE JUNCTION OF ELIZABETH LAKE CANYON ROAD AND 80TH ST. W, IN LEONA VALLEY.
General: UNKNOWN NUMBER OF PLANTS SEEN IN 1990. NEEDS FIELDWORK.
Owner/Manager: UNKNOWN

Emys (=Clemmys) marmorata pallida

southwestern pond turtle

Element Code: ARAAD02032

Status — **Federal:** None **State:** None

NDDB Element Ranks — **Global:** G3G4T2T3Q **State:** S2

Other Lists — **CDFG Status:** SC

Habitat Associations

General: INHABITS PERMANENT OR NEARLY PERMANENT BODIES OF WATER IN MANY HABITAT TYPES; BELOW 6000 FT ELEV.

Micro: REQUIRE BASKING SITES SUCH AS PARTIALLY SUBMERGED LOGS, VEGETATION MATS, OR OPEN MUD BANKS. NEED SUITABLE NESTING SITES.

Occurrence No. 149 **Map Index:** 17287 **EO Index:** 9696

Dates Last Seen — **Element:** 1999-09-15 **Site:** 1999-09-15

* SENSITIVE *

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WEINTRAUB, J. 1990 (OBS)

Record Last Updated: 2000-01-18

Quad Summary: RITTER RIDGE (3411852/161C), SLEEPY VALLEY (3411853/162D)
County Summary: LOS ANGELES

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: HABITAT CONSISTS OF RIPARIAN; CREEK CONTAINS SMALL PONDED AREAS OF WATER. THE MAIN POOL IS LOCATED NEXT TO THE ROADWAY WHERE IT CROSSES BENEATH THE ROAD. THIS AREA CONTAINS SMALL REEDS BUT NO TREES.

Threat: POSSIBLE THREAT OF DEVELOPMENT AND HUMAN DISTURBANCE DUE TO THE POOL'S PROXIMITY TO THE ROADWAY.

Owner/Manager:

Occurrence No. 150 **Map Index:** 17288 **EO Index:** 9701

Dates Last Seen — **Element:** 1990-05-19 **Site:** 1990-05-19

* SENSITIVE *

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WEINTRAUB, J. 1990 (OBS)

Record Last Updated: 1995-10-25

Quad Summary: LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: HABITAT CONSISTS OF SEVERAL SMALL LAKES RINGED BY CATTAILS, WHICH APPEARS TO BE A CONTINUATION OF THE EASTERN MARSHLAND OF ELIZABETH LAKE.

Threat: POTENTIAL THREAT OF DEVELOPMENT.

Owner/Manager:

Erodium macrophyllum

round-leaved filaree

Element Code: PDGER01070

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4
State: S2.1

Other Lists
CNPS List: 2
R-E-D Code: 2-3-1

Habitat Associations
General: CISMONTANE WOODLAND, VALLEY AND FOOTHILL GRASSLAND.
Micro: CLAY SOILS. 15-1200M.

Occurrence No. 7 **Map Index:** 01640 **EO Index:** 45686

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: PARISH, S. #1906 JEPS #61401 (HERB)

Dates Last Seen
Element: 1888-06-XX
Site: 1888-06-XX
Record Last Updated: 2001-08-28

Quad Summary: LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

Lat/Long: 34.66387º / -118.40396º
UTM: Zone-11 N3836665 E371359
Radius: 1 mile
Elevation: 3,400 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 14W
Section: 30 **Qtr:** XX
Meridian: S

Location: ELIZABETH LAKE.
General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1888 COLLECTION BY PARISH. NEEDS FIELDWORK.
Owner/Manager: UNKNOWN

Falco mexicanus

prairie falcon

Element Code: ABNKD06090

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5
State: S3

Other Lists
CDFG Status: SC

Habitat Associations
General: (NESTING) INHABITS DRY, OPEN TERRAIN, EITHER LEVEL OR HILLY.
Micro: BREEDING SITES LOCATED ON CLIFFS. FORAGES FAR AFIELD, EVEN TO MARSHLANDS AND OCEAN SHORES.

Occurrence No. 405 **Map Index:** 02034 **EO Index:** 26021

Dates Last Seen
Element: 1978-06-16
Site: 1978-06-16
Record Last Updated: 1989-08-10

*** SENSITIVE ***
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CDFG RAPTOR NEST FILES 1981 (PERS)

Quad Summary: SOLEDAD MTN. (3411882/186B)
County Summary: KERN

*** SENSITIVE ***
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Owner/Manager:

Galium grande

San Gabriel bedstraw

Element Code: PDRUB0N0V0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1
State: S1.2

Other Lists
CNPS List: 1B
R-E-D Code: 3-1-3

Habitat Associations
General: CISMONTANE WOODLAND, CHAPARRAL, BROADLEAFED UPLAND FOREST, LOWER MONTANE CONIFEROUS FOREST.
Micro: OPEN CHAPARRAL AND LOW, OPEN OAK FOREST; ON ROCKY SLOPES; PROBABLY UNDERCOLLECTED DUE TO INACCESSIBLE HAB. 425-1200M.

Occurrence No. 2 **Map Index:** 24643 **EO Index:** 6888

Dates Last Seen
Element: XXXX-XX-XX
Site: 1979-06-20

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: KRANTZ, T. 1979 (PERS)

Record Last Updated: 1993-12-13

Quad Summary: WARM SPRINGS MOUNTAIN (3411855/163D)
County Summary: LOS ANGELES

Lat/Long: 34.55968º / -118.56180º
UTM: Zone-11 N3825323 E356717
Radius: 1 mile
Elevation: 2,000 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 06N
Range: 16W
Section: 34 **Qtr:** XX
Meridian: S

Location: SOUTH OF ELIZABETH LAKE GUARD STATION, NORTHEAST OF CASTAIC.
Ecological: ON ROCKY SLOPES IN OPEN CHAPARRAL.
General: UNKNOWN WHEN SPECIES OBSERVED HERE. KRANTZ SEARCHED THE AREA IN 1979 BUT RESULTS WERE NEGATIVE. NOT LIKELY THAT POPULATION IS ENDANGERED DUE TO INACCESSABLILITY OF THE RUGGED TERRAIN.
Owner/Manager: USFS-ANGELES NF

Gasterosteus aculeatus williamsoni

unarmored threespine stickleback

Element Code: AFCPA03011

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G5T1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: WEEDY POOLS, BACKWATERS, AND AMONG EMERGENT VEGETATION AT THE STREAM EDGE IN SMALL SOUTHERN CALIFORNIA STREAMS.
Micro: COOL (<24 C), CLEAR WATER WITH ABUNDANT VEGETATION.

Occurrence No. 2 **Map Index:** 01308 **EO Index:** 20033

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. FISH & WILDLIFE SERVICE 1997 (LIT)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 1998-07-01

Quad Summary: GREEN VALLEY (3411854/162C), WARM SPRINGS MOUNTAIN (3411855/163D)
County Summary: LOS ANGELES

Lat/Long: 34.54669º / -118.51284º
UTM: Zone-11 N3823814 E361188
Area: 608.8 ac
Elevation: 1,760 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON
Township: 05N
Range: 15W
Section: 06 **Qtr:** NE
Meridian: S

Location: CREEK IN SAN FRANCISQUITO CANYON, TRIBUTARY TO SANTA CLARA RIVER.
Location Detail: FOUND FROM 100 M UPSTREAM OF SAN FRANCISQUITO CYN RD UPSTREAM TO SAN FRANCISQUITO POWERHOUSE NO. 1.

Owner/Manager: USFS-ANGELES NF

Gymnogyps californianus

California condor

Element Code: ABNKA03010

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: REQUIRE VAST EXPANSES OF OPEN SAVANNAH, GRASSLANDS, AND FOOTHILL CHAPARRAL IN MOUNTAIN RANGES OF MODERATE ALTITUDE.
Micro: DEEP CANYONS CONTAINING CLEFTS IN THE ROCKY WALLS PROVIDE NESTING SITES. FORAGES UP TO 100 MILES FROM ROOST/NEST.

Occurrence No. 2 **Map Index:** 00758 **EO Index:** 14758

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WILBUR, S. 1981 (PERS)

Dates Last Seen
Element: 1976-10-14
Site: 1976-10-14

Record Last Updated: 1989-08-10

Quad Summary: LIEBRE TWINS (3411885/188A), WINTERS RIDGE (3411886/188B)
County Summary: KERN

Lat/Long: 34.95887º / -118.65975º
UTM: Zone-11 N3869739 E348461
Area: 19,746.7 ac
Elevation: 4,200 ft

Mapping Precision SPECIFIC
Symbol Type: POLYGON

Township: 10N
Range: 17W
Section: 10 **Qtr:** NE
Meridian: S

Location: TEJON RANCH.

General: ROOSTING AREA FROM OCTOBER THROUGH APRIL.

Owner/Manager: PVT

Loeflingia squarrosa var. artemisiarum

sagebrush loeflingia

Element Code: PDCAR0E011

Status — **Federal:** None; **State:** None

NDDB Element Ranks — **Global:** G5T2T3; **State:** S2.2

Other Lists — **CNPS List:** 2; **R-E-D Code:** 2-2-1

Habitat Associations

General: GREAT BASIN SCRUB, SONORAN DESERT SCRUB, DESERT DUNES.

Micro: SANDY FLATS AND DUNES. SANDY AREAS AROUND CLAY SLICKS W/SARCOBATUS, ATRIPLEX, TETRADYMIA, ETC. 700-1200M.

Occurrence No. 2 **Map Index:** 35325 **EO Index:** 29334

Dates Last Seen — **Element:** XXXX-XX-XX; **Site:** XXXX-XX-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOFFMANN SN SBM (HERB)

Record Last Updated: 1996-09-16

Quad Summary: ROSAMOND (3411872/186C)
County Summary: LOS ANGELES

Lat/Long: 34.77450º / -118.17066º
UTM: Zone-11 N3848660 E392880
Radius: 1 mile
Elevation: 2,325 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 12W
Section: 20 **Qtr:** XX
Meridian: S

Location: 5 MILES NORTH OF LANCASTER.

General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS UNDATED COLLECTION BY HOFFMANN CITED IN "NOTES ON LOEFLINGA" BY BARNABY AND TWISSELMANN IN MADRONO 20 (1970). NEED BETTER LOCATION INFO.

Owner/Manager: UNKNOWN

Occurrence No. 14 **Map Index:** 48521 **EO Index:** 48521

Dates Last Seen — **Element:** 1998-06-18; **Site:** 1998-06-18

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: PRESTON, R. 1998 (OBS)

Record Last Updated: 2002-08-09

Quad Summary: SOLEDAD MTN. (3411882/186B)
County Summary: KERN

Lat/Long: 34.97626º / -118.13640º
UTM: Zone-11 N3871000 E396269
Area: 8.3 ac
Elevation: 2,560 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 10N
Range: 12W
Section: 10 **Qtr:** NE
Meridian: S

Location: ~5.5 AIRMI SSE OF MOJAVE. APPROXIMATELY 0.8 MILE ESE OF UNITED STREET/REED AVENUE INTERSECTION, NORTHEAST OF ACTIS.

Location Detail: POPULATION OCCURS ALONG UNNAMED ROAD WITHIN NE 1/4 OF SECTION 10.

Ecological: SANDY AREA W/ TETRADYMIA STENOLEPIS, KRASCHENINNIKOVIA LANATA, YUCCA BREVIFOLIA, & HYMENOCLEA SALSOLA.

Threat: OFF-ROAD VEHICLES, DEVELOPMENT OF RURAL LOTS, ROADSIDE OCCURRENCE.

General: SITE WITHIN AT&T COAXIAL CABLE RIGHT-OF-WAY, CABLE TO BE REMOVED & ROW ABANDONED, POPULATION AVOIDED.

Owner/Manager: PVT

Onychomys torridus ramona

southern grasshopper mouse

Element Code: AMAFF06022

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T3?
State: S3?

Other Lists
CDFG Status: SC

Habitat Associations
General: DESERT AREAS, ESPECIALLY SCRUB HABITATS WITH FRIABLE SOILS FOR DIGGING. PREFERS LOW TO MODERATE SHRUB COVER.
Micro: FEEDS ALMOST EXCLUSIVELY ON ARTHROPODS, ESPECIALLY SCORPIONS & ORTHOPTERAN INSECTS.

Occurrence No. 24 **Map Index:** 58477 **EO Index:** 58513

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MANIS 2004 (MUS)

Dates Last Seen
Element: 1930-11-02
Site: 1930-11-02
Record Last Updated: 2004-12-10

Quad Summary: AGUA DULCE (3411843/137A), MINT CANYON (3411844/137B), SLEEPY VALLEY (3411853/162D), GREEN VALLEY (3411854/162C)
County Summary: LOS ANGELES

Lat/Long: 34.50068º / -118.38141º
UTM: Zone-11 N3818539 E373178
Radius: 1 mile
Elevation: 2,100 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 05N
Range: 14W
Section: 19 **Qtr:** XX
Meridian: S

Location: ANGELES NATIONAL FOREST. MINT CANYON ABOUT 3 MILES WEST OF AGUA DULCE.

General: 1 FEMALE SPECIMEN COLLECTED BY C. LAMB ON 2 NOV 1930 AT "MINT CANYON." DEPOSITIED AT MVZ # 47188.

Owner/Manager: USFS-ANGELES NF

Perognathus alticolus inexpectatus

Tehachapi pocket mouse

Element Code: AMAFD01082

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1G2T1T2
State: S1S2

Other Lists
CDFG Status: SC

Habitat Associations
General: ARID ANNUAL GRASSLAND & DESERT SHRUB COMMUNITIES BUT ALSO TAKEN IN FALLOW GRAIN FIELD & IN RUSSIAN THISTLE.
Micro: BURROWS FOR COVER & NESTING. AESTIVATES AND HIBERNATES DURING EXTREME WEATHER. FORAGES ON OPEN GROUND & UNDER SHRUBS.

Occurrence No. 10 **Map Index:** 01640 **EO Index:** 23897

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: VON BLOEKER, J. 1938 (MUS)

Dates Last Seen
Element: 1938-07-16
Site: 1981-07-24

Record Last Updated: 1989-08-10

Quad Summary: LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

Lat/Long: 34.66387º / -118.40396º
UTM: Zone-11 N3836665 E371359
Radius: 1 mile
Elevation: 3,400 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 07N
Range: 14W
Section: 30 **Qtr:** XX
Meridian: S

Location: ELIZABETH LAKE, NEAR LAKE HUGHES.
Location Detail: IN 1981, SULENTICH TRAPPED 0.25 MI NE LAKE HUGES AT 3375 FT AND HAD NO SUCCESS. ALSO NO SUCCESS 200 M N OF W END LAKE ELIZABETH AT 3400 FT.
General: FOUR LACNHM SPECIMENS COLL 14 JULY TO 16 JULY, 1938. COLL #S 5017 - 5020.
Owner/Manager: USFS-ANGELES NF, PVT

Phrynosoma coronatum (blainvillei)

Coast (San Diego) horned lizard

Element Code: ARACF12021

Status — **Federal:** None **State:** None

NDDB Element Ranks — **Global:** G4T3T4 **State:** S2S3

Other Lists — **CDFG Status:** SC

Habitat Associations

General: INHABITS COASTAL SAGE SCRUB AND CHAPARRAL IN ARID AND SEMI-ARID CLIMATE CONDIT

Micro: PREFERS FRIABLE, ROCKY, OR SHALLOW SANDY SOILS.

Occurrence No. 147 **Map Index:** 02186 **EO Index:** 28068

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BRODE, J. 1986 (PERS)

Dates Last Seen — **Element:** XXXX-XX-XX **Site:** XXXX-XX-XX
Record Last Updated: 1989-08-10

Quad Summary: LANCASTER EAST (3411861/161A), LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.65831º / -118.13118º
UTM: Zone-11 N3835734 E396348
Radius: 1 mile
Elevation: 2,480 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 12W
Section: 34 **Qtr:** NE
Meridian: S

Location: 2 MI S LANCASTER ON HWY 6.

General: LACM SPECIMEN; DATE OF COLLECTION UNKNOWN.

Owner/Manager: UNKNOWN

Occurrence No. 157 **Map Index:** 01549 **EO Index:** 28059

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BRODE, J. 1986 (PERS)

Dates Last Seen — **Element:** XXXX-XX-XX **Site:** XXXX-XX-XX
Record Last Updated: 1989-08-10

Quad Summary: LAKE HUGHES (3411864/162B), FAIRMONT BUTTE (3411874/187C)
County Summary: LOS ANGELES

Lat/Long: 34.73609º / -118.42397º
UTM: Zone-11 N3844700 E369639
Radius: 1 mile
Elevation: 2,800 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N
Range: 15W
Section: 36 **Qtr:** SW
Meridian: S

Location: FAIRMONT, 4 MI NNE OF LAKE HUGHES.

General: SDNHM SPECIMEN; DATE OF COLLECTION UNKNOWN.

Owner/Manager: UNKNOWN

Occurrence No. 443 **Map Index:** 42141 **EO Index:** 42141

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MUTH, D. 1995 (OBS)

Dates Last Seen — **Element:** 1995-05-21 **Site:** 1995-05-21
Record Last Updated: 2000-02-02

Quad Summary: SLEEPY VALLEY (3411853/162D)
County Summary: LOS ANGELES

Lat/Long: 34.59882º / -118.25875º
UTM: Zone-11 N3829275 E384575
Radius: 2/5 mile
Elevation: 3,200 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 06N
Range: 13W
Section: 21 **Qtr:** NE
Meridian: S

Location: 0.75 MILE SOUTH OF THE INTERSECTION OF ELIZABETH LAKE ROAD AND QUARTZ HILL ROAD, WEST OF PALMDALE.

Location Detail: LIZARDS OBSERVED ON THE BERM OF ROGERS CREEK POND.

Ecological: HABITAT CONSISTS OF A MIXTURE OF SCRUB AND GRASSLAND.

Threat: THREATENED BY PROPOSED DEVELOPMENT.

General: 2 ADULTS OBSERVED ON 21 MAY 1995.

Owner/Manager: PVT

Phrynosoma coronatum (blainvillei)

Coast (San Diego) horned lizard

Element Code: ARACF12021

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4T3T4
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: INHABITS COASTAL SAGE SCRUB AND CHAPARRAL IN ARID AND SEMI-ARID CLIMATE CONDIT
Micro: PREFERS FRIABLE, ROCKY, OR SHALLOW SANDY SOILS.

Occurrence No. 458 **Map Index:** 46981 **EO Index:** 46981

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HARRIS, S. C. 2001 (OBS)

Dates Last Seen
Element: 2001-09-27
Site: 2001-09-27
Record Last Updated: 2002-01-15

Quad Summary: LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

Lat/Long: 34.66957º / -118.43252º
UTM: Zone-11 N3837334 E368752
Radius: 80 meters
Elevation: 3,287 ft
Mapping Precision SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 15W
Section: 26 **Qtr:** NE
Meridian: S

Location: PAINTED TURTLE CAMP, LAKE HUGHES
Ecological: HABITAT CONSISTS OF RECOVERING CHAPARRAL.
Threat: THREATENED BY OFF-ROAD VEHICLES.
General: 1 JUVENILE OBSERVED FORAGING IN OPEN CHAPARRAL ON 27 SEP 2001.
Owner/Manager: PVT

Occurrence No. 522 **Map Index:** 56325 **EO Index:** 56341

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SAPPHOS ENVIRONMENTAL, INC.

Dates Last Seen
Element: 2004-04-XX
Site: 2004-04-XX
Record Last Updated: 2004-08-05

Quad Summary: RITTER RIDGE (3411852/161C), SLEEPY VALLEY (3411853/162D)
County Summary: LOS ANGELES

Lat/Long: 34.50909º / -118.25067º
UTM: Zone-11 N3819315 E385193
Radius: 1/5 mile
Elevation: 3,400 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 05N
Range: 13W
Section: 21 **Qtr:** NW
Meridian: S

Location: JUST NORTH OF VALLEY SAGE ROAD, 0.25 MILE NORTH OF HWY 14 AND APPROXIMATELY 0.25 MILE WEST OF HISTORIC PURITAN MINE.
Ecological: HABITAT CONSISTS OF JUNIPER WOODLAND WITH LOOSE, FRIABLE SOILS. SURROUNDING LAND IS RESIDENTIAL. DISTURBANCES INCLUDE TRASH, HISTORIC MINING AND RECREATION.
General: 1 OBSERVED DURING APRIL 2004.
Owner/Manager: PVT

Phrynosoma coronatum (frontale)

Coast (California) horned lizard

Element Code: ARACF12022

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4T3T4
State: S3S4

Other Lists
CDFG Status: SC

Habitat Associations
General: FREQUENTS A WIDE VARIETY OF HABITATS, MOST COMMON IN LOWLANDS ALONG SANDY WASHES WITH SCATTERED LOW BUSHES.
Micro: OPEN AREAS FOR SUNNING, BUSHES FOR COVER, PATCHES OF LOOSE SOIL FOR BURIAL, & ABUNDANT SUPPLY OF ANTS & OTHER INSECTS.

Occurrence No. 8 **Map Index:** 39837 **EO Index:** 34839

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: YORKE, C. 1991 (OBS)

Dates Last Seen
Element: 1991-05-15
Site: 1991-05-15
Record Last Updated: 1998-09-28

Quad Summary: LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.63468º / -118.21594º
UTM: Zone-11 N3833204 E388549
Radius: 80 meters
Elevation: 2,585 ft

Mapping Precision SPECIFIC
Symbol Type: POINT

Township: 06N
Range: 13W
Section: 01 **Qtr:** SW
Meridian: S

Location: 4733 WEST AVE., M-12, 0.15 MILE EAST OF JUNCTION WITH 50TH STREET WEST, QUARTZ HILL.
Location Detail: IN FRONT YARD NEAR HIGH DENSITY POPULATION OF ANTS.
Ecological: LAWNS, GARDENS, SINGLE FAMILY RESIDENCES ON 3/4 ACRE LOTS IN OLD ALMOND ORCHARD. SEVERAL VACANT OR OVERGROWN LOTS ON M-12, COULD SUPPORT A VIABLE POPULATION OF P.CORONATUM HERE.
Threat: DEVELOPMENT.
General: 1 OBSERVED, 1991. IT WAS STATED THAT MORE SURVEYS NEEDED IN THE QUARTZ HILL AREA; PREVIOUS RECORDS OF P.C. BLAINVILLEI COULD BE ERRONEOUS.
Owner/Manager: PVT

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status
Federal: Threatened
State: None

NDDB Element Ranks
Global: G4T2T3
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 167 **Map Index:** 33439 **EO Index:** 1580

Dates Last Seen
Element: 1995-05-XX
Site: 1995-05-XX

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 1995 (OBS)

Record Last Updated: 1996-08-27

Quad Summary: SLEEPY VALLEY (3411853/162D)
County Summary: LOS ANGELES

Lat/Long: 34.60652º / -118.26148º
UTM: Zone-11 N3830132 E384336
Radius: 80 meters
Elevation: 3,020 ft

Mapping Precision SPECIFIC
Symbol Type: POINT

Township: 06N
Range: 13W
Section: 16 **Qtr:** SE
Meridian: S

Location: RITTER RANCH, 9 MILES WEST OF PALMDALE.

Ecological: HABITAT CONSISTS OF A POND FED BY ARTESIAN SPRINGS. VEGETATION CONSISTS OF RIPARIAN VEGETATION, PRIMARILY WILLOW; 20-30% CATTAILS/BULRUSH.

Threat: THREATS INCLUDE A LARGE, BREEDING POPULATION OF AFRICAN CLAWED FROGS AND A PROPOSED RESIDENTIAL DEVELOPMENT.

General: 4 ADULTS OBSERVED IN MAY 1995; NO LARVAL RED-LEGGED FROGS WERE CAPTURED DURING EXTENSIVE POND SAMPLING (SEINING AND DIPNETTING).

Owner/Manager: PVT

Spermophilus mohavensis

Mohave ground squirrel

Element Code: AMAFB05150

Status — **Federal:** None; **State:** Threatened

NDDB Element Ranks — **Global:** G2G3; **State:** S2S3

Other Lists — **CDFG Status:**

Habitat Associations

General: OPEN DESERT SCRUB, ALKALI SCRUB & JOSHUA TREE WOODLAND. ALSO FEEDS IN ANNUAL GRASSLANDS. RESTRICTED TO MOHAVE DESERT.

Micro: PREFERS SANDY TO GRAVELLY SOILS, AVOIDS ROCKY AREAS. USES BURROWS AT BASE OF SHRUBS FOR COVER. NESTS ARE IN BURROWS.

Occurrence No. 26 **Map Index:** 02196 **EO Index:** 7360

Dates Last Seen — **Element:** 1984-06-14; **Site:** 1984-06-14

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BUREAU OF LAND MANAGEMENT 1985 (LIT)
Record Last Updated: 1993-09-24

Quad Summary: LANCASTER EAST (3411861/161A), LANCASTER WEST (3411862/161B)
County Summary: LOS ANGELES

Lat/Long: 34.67380º / -118.12153º
UTM: Zone-11 N3837442 E397251
Radius: 1 mile
Elevation: 2,440 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 07N
Range: 12W
Section: 26 **Qtr:** XX
Meridian: S

Location: VICINITY OF LANCASTER.

Location Detail: 1920 COLLECTION WAS IN SEC 26; 1984 DETECTION WAS IN SEC 23.

General: ONE MALE COLLECTED ON 16 JUL 1920 (MVZ #31967); 1 SQUIRREL DETECTED 14 JUN 1984 BY MCKERNAN (DC #271).

Owner/Manager: UNKNOWN

Occurrence No. 281 **Map Index:** 22839 **EO Index:** 7874

Dates Last Seen — **Element:** 1973-XX-XX; **Site:** 1973-XX-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CLARK, D. 1992 (PERS)
Record Last Updated: 1993-02-18

Quad Summary: ROSAMOND (3411872/186C)
County Summary: KERN

Lat/Long: 34.86094º / -118.16107º
UTM: Zone-11 N3858236 E393868
Radius: 1/5 mile
Elevation: 2,325 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 09N
Range: 12W
Section: 21 **Qtr:** NW
Meridian: S

Location: ROSAMOND, APPROXIMATELY 100 METERS EAST OF SIERRA HIGHWAY.

General: UNKNOWN NUMBER OF SQUIRRELS DETECTED BY RECHT IN 1973 (DC239).

Owner/Manager: UNKNOWN

Tamias speciosus speciosus

Lodgepole chipmunk

Element Code: AMAFB02172

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T3?
State: S3?

Other Lists
CDFG Status:

Habitat Associations
General: SUMMITS OF ISOLATED PIUTE, SAN BERNARDINO, AND SAN JACINTO MOUNTAINS IN SOUTHERN CALIFORNIA
Micro:

Occurrence No. 8 **Map Index:** 58592 **EO Index:** 58628

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MANIS 2004 (MUS)

Dates Last Seen
Element: 1974-09-03
Site: 1974-09-03
Record Last Updated: 2004-12-14

Quad Summary: GREEN VALLEY (3411854/162C), LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

Lat/Long: 34.62033º / -118.41126º
UTM: Zone-11 N3831846 E370622
Radius: 1 mile
Elevation: 3,000 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 06N
Range: 14W
Section: 07 **Qtr:** XX
Meridian: S

Location: GREEN VALLEY, ANGELES NATIONAL FOREST.
Location Detail: MAPPED ACCORDING TO COORDINATES PROVIDED BY MANIS. LOCATION UNCERTAINTY GIVEN AS 6010.8998 M (3.75 MI)
General: 2 SPECIMENS COLLECTED (1 MALE & 1 FEMALE) 2-3 SEP 1974 BY K. MCDONALD AT "GREEN VALLEY [PLOT], NE, SAN BERNARDINO NATIONAL FOREST." DEPOSITED AT MVZ #176117 & 176118.
Owner/Manager: USFS-ANGELES NF

Taxidea taxus

American badger

Element Code: AMAJF04010

Status — **Federal:** None **State:** None

NDDB Element Ranks — **Global:** G5 **State:** S4

Other Lists — **CDFG Status:** SC

Habitat Associations

General: MOST ABUNDANT IN DRIER OPEN STAGES OF MOST SHRUB, FOREST, AND HERBACEOUS HABITATS, WITH FRIABLE SOILS.

Micro: NEED SUFFICIENT FOOD, FRIABLE SOILS & OPEN, UNCULTIVATED GROUND. PREY ON BURROWING RODENTS. DIG BURROWS.

Occurrence No. 26 **Map Index:** 56527 **EO Index:** 56543

Dates Last Seen — **Element:** 1988-05-16 **Site:** 1988-05-16

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LAPRE, L. 1988 (OBS)
Record Last Updated: 2004-08-30

Quad Summary: LAKE HUGHES (3411864/162B)
County Summary: LOS ANGELES

Lat/Long: 34.68657º / -118.45049º
UTM: Zone-11 N3839243 E367132
Area: 42.6 ac
Elevation: 3,800 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON
Township: 07N **Range:** 15W **Section:** 22 **Qtr:** NE **Meridian:** S

Location: 0.6 MILE NORTH OF LAKE HUGHES

Ecological: HABITAT CONSISTS OF CHAPARRAL, DOMINATED BY ADENOSTOMA, ARCTOSTAPHYLOS, CEANOTHUS, CERCOCARPUS, AND PINUS COULTERI.

Threat: POSSIBLY THREATENED BY A WASTEWATER TREATMENT PLANT.

General: AN ACTIVE DEN WAS OBSERVED, 13-16 MAY 1988.

Owner/Manager: UNKNOWN

Occurrence No. 151 **Map Index:** 01549 **EO Index:** 56863

Dates Last Seen — **Element:** 1904-06-21 **Site:** 1904-06-21

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MVZ 2004 (MUS)
Record Last Updated: 2004-09-20

Quad Summary: LAKE HUGHES (3411864/162B), FAIRMONT BUTTE (3411874/187C)
County Summary: LOS ANGELES

Lat/Long: 34.73609º / -118.42397º
UTM: Zone-11 N3844700 E369639
Radius: 1 mile
Elevation: 2,800 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 08N **Range:** 15W **Section:** 36 **Qtr:** SW **Meridian:** S

Location: FAIRMONT, ANTELOPE VALLEY.

Location Detail: MAPPED ACCORDING TO LAT/LONG GIVEN BY MVZ; MAX ERROR DISTANCE: 1 KM.

General: MALE COLLECTED (MVZ #7077) BY JOSEPH GRINNELL ON 21 JUN 1904. 1 COLLECTED (DATE UNKNOWN), LACM.

Owner/Manager: UNKNOWN

Occurrence No. 282 **Map Index:** 57473 **EO Index:** 57489

Dates Last Seen — **Element:** XXXX-XX-XX **Site:** XXXX-XX-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CDFG 1986 (LIT)
Record Last Updated: 2004-10-19

Quad Summary: LITTLE BUTTES (3411873/187D), WILLOW SPRINGS (3411883/187A)
County Summary: KERN

Lat/Long: 34.87842º / -118.29677º
UTM: Zone-11 N3860327 E381488
Radius: 1 mile
Elevation: 2,520 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 09N **Range:** 13W **Section:** 07 **Qtr:** XX **Meridian:** S

Location: WILLOW SPRINGS.

General: 1 COLLECTED, AMNH (AMERICAN MUSEUM OF NATURAL HISTORY).

Owner/Manager: UNKNOWN

Taxidea taxus

American badger

Element Code: AMAJF04010

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5
State: S4

Other Lists
CDFG Status: SC

Habitat Associations
General: MOST ABUNDANT IN DRIER OPEN STAGES OF MOST SHRUB, FOREST, AND HERBACEOUS HABITATS, WITH FRIABLE SOILS.
Micro: NEED SUFFICIENT FOOD, FRIABLE SOILS & OPEN, UNCULTIVATED GROUND. PREY ON BURROWING RODENTS. DIG BURROWS.

Occurrence No. 334 **Map Index:** 57756 **EO Index:** 57772

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CDFG 1986 (LIT)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Record Last Updated: 2004-10-27

Quad Summary: NEENACH SCHOOL (3411875/188D)
County Summary: KERN, LOS ANGELES

Lat/Long: 34.82942º / -118.57052º
UTM: Zone-11 N3855251 E356383
Radius: 1 mile
Elevation:

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 09N
Range: 16W
Section: 34 **Qtr:** XX
Meridian: S

Location: ANTELOPE VALLEY, NEAR NEENACH, KERN COUNTY.
Location Detail: AREA MAPPED IS IN THE VICINITY OF THE LOS ANGELES AQUEDUCT TO THE NORTH AND THE KERN COUNTY LINE TO THE SOUTH.
General: 1 COLLECTED, FMNH (FIELD MUSEUM OF NATURAL HISTORY, CHICAGO).
Owner/Manager: UNKNOWN

Thamnophis hammondii

two-striped garter snake

Element Code: ARADB36160

Status
Federal: None
State: None

NDDB Element Ranks
Global: G3
State: S2

Other Lists
CDFG Status: SC

Habitat Associations
General: COASTAL CALIFORNIA FROM VICINITY OF SALINAS TO NORTHWEST BAJA CALIFORNIA. FROM SEA TO ABOUT 7,000 FT ELEVATION.
Micro: HIGHLY AQUATIC, FOUND IN OR NEAR PERMANENT FRESH WATER. OFTEN ALONG STREAMS WITH ROCKY BEDS AND RIPARIAN GROWTH.

Occurrence No. 54 **Map Index:** 17287 **EO Index:** 42186

Dates Last Seen
Element: 1999-09-15
Site: 1999-09-15

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MUTH, D. 1997 (OBS)

Record Last Updated: 2000-01-18

Quad Summary: RITTER RIDGE (3411852/161C), SLEEPY VALLEY (3411853/162D)
County Summary: LOS ANGELES

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: AMARGOSA CREEK, ALONG THE NORTH SIDE OF ELIZABETH LAKE PINE CANYON ROAD, APPROXIMATELY 7 MILES WNW OF PALMDALE.

Ecological: HABITAT CONSISTS OF RIPARIAN; CREEK CONTAINS SMALL PONDED AREAS OF WATER. THE MAIN POOL IS LOCATED NEXT TO THE ROADWAY WHERE IT CROSSES BENEATH THE ROAD. THIS AREA CONTAINS SMALL REEDS BUT NO TREES.

Threat: POSSIBLE THREATS INCLUDE AFRICAN CLAWED FROGS AND CATFISH.

General: 1 VERY LARGE ADULT FEMALE AND 1 JUVENILE OBSERVED ON 6 MAY 1997. 1 ADULT MALE (MARKED) OBSERVED ON 5 JUN 1997. 1 JUVENILE OBSERVED CRAWLING ACROSS THE DRIED CREEK BOTTOM ON 15 SEP 1999.

Owner/Manager: CITY OF PALMDALE

Toxostoma lecontei

Le Conte's thrasher

Element Code: ABPBK06100

Status
Federal: None
State: None

NDDB Element Ranks
Global: G3
State: S3

Other Lists
CDFG Status: SC

Habitat Associations
General: DESERT RESIDENT; PRIMARILY OF OPEN DESERT WASH, DESERT SCRUB, ALKALI DESERT SCRUB, AND DESERT SUCCULENT SCRUB HABITATS.
Micro: COMMONLY NESTS IN A DENSE, SPINY SHRUB OR DENSELY BRANCHED CACTUS IN DESERT WASH HABITAT, USUALLY 2-8 FEET ABOVE GROUND.

Occurrence No. 57 **Map Index:** 01703 **EO Index:** 24519

Dates Last Seen
Element: 1968-09-21
Site: 1968-09-21
Record Last Updated: 1989-08-10

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BUREAU OF LAND MANAGEMENT 1980 (LIT)

Quad Summary: LITTLE BUTTES (3411873/187D), FAIRMONT BUTTE (3411874/187C), WILLOW SPRINGS (3411883/187A), TYLERHORSE CANYON (3411884/187B)
County Summary: KERN

Lat/Long: 34.87886º / -118.38201º
UTM: Zone-11 N3860480 E373699
Radius: 1 mile
Elevation: 2,720 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 09N
Range: 14W
Section: 08 **Qtr:** SE
Meridian: S

Location: 5 MILES WEST OF WILLOW SPRINGS, IN THE VICINITY OF THE INTERSECTION OF MEERS ROAD AND 104TH STREET WEST.
General: LACM SPECIMEN #80669.
Owner/Manager: UNKNOWN

Occurrence No. 141 **Map Index:** 02137 **EO Index:** 6133

Dates Last Seen
Element: 1986-06-01
Site: 1986-06-01
Record Last Updated: 1989-08-10

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ENGLAND, S. 1987 (LIT)

Quad Summary: SOLEDAD MTN. (3411882/186B)
County Summary: KERN

Lat/Long: 34.90857º / -118.16007º
UTM: Zone-11 N3863517 E394021
Radius: 1/5 mile
Elevation: 2,550 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 09N
Range: 12W
Section: 04 **Qtr:** NW
Meridian: S

Location: EAST OF ROSAMOND HILLS, DAWN ROAD, 0.3 MI E OF HWY 14.
Location Detail: ONE OBSERVED DURING 1986 BREEDING SEASON IN SUITABLE HABITAT.
Ecological: VEGETATION WITHIN A 50 M RADIUS INCLUDES YUCCA BREVIFOLIA, LARREA TRIDENTATA, AMBROSIA DUMOSA AND HYMENOCLEA SALSOLA.
Threat: DUMPING, CAMPING, AND OFF-ROAD VEHICLE ACTIVITY OCCUR IN HABITAT.
Owner/Manager: PVT

<- Revise Selection

Make Official Letter ->

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 051011085420

Database Last Updated: September 30, 2005

CRITICAL HABITAT:

On August 11, 2005, the Service published a revised critical habitat designation for vernal pool species. It did not specify critical habitat locations on a species by species basis. If there are species on the list(s) below that were covered under the rule, they are shown because we believe that they are present in the area or may be affected by projects in the area, not because it has specifically been designated as critical habitat for them.

Quad Lists

SOLEDAD MTN (186B)

Species of Concern

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Numenius americanus - long-billed curlew (SC)

ROSAMOND (186C)

Species of Concern

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Cypseloides niger - black swift (SC)

Numenius americanus - long-billed curlew (SC)

Plants

Calochortus striatus - alkali mariposa lily (SC)

WILLOW SPRINGS (187A)

Species of Concern

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Calypte costae - Costa's hummingbird (SC)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Chaetura vauxi - Vaux's swift (SC)

Charadrius montanus - mountain plover (SC)

Cypseloides niger - black swift (SC)

Numenius americanus - long-billed curlew (SC)

Toxostoma redivivum - California thrasher (SC)

TYLERHORSE CANYON (187B)

Listed Species

Amphibians

Rana aurora draytonii - California red-legged frog (T)

Birds

Gymnogyps californianus - California condor (E)

Haliaeetus leucocephalus - bald eagle (T)

Species of Concern

Invertebrates

Plebulina emigdionis - San Emigdio blue butterfly (SC)

Speyeria egleis tehachapina - Tehachapi mountain silverspot butterfly (SC)

Fish

Pogonichthys macrolepidotus - Sacramento splittail (SC)

Amphibians

Batrachoseps stebbinsi - Tehachapi slender salamander (CA)

Spea hammondii (was Scaphiopus h.) - western spadefoot toad (SC)

Reptiles

Lichanura trivirgata - rosy boa (SC)

Phrynosoma coronatum frontale - California horned lizard (SC)

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo regalis - ferruginous hawk (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Calypte costae - Costa's hummingbird (SC)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Chaetura vauxi - Vaux's swift (SC)

Charadrius montanus - mountain plover (SC)

Cypseloides niger - black swift (SC)

Falco peregrinus anatum - American peregrine falcon (D)

Lanius ludovicianus - loggerhead shrike (SC)

Melanerpes lewis - Lewis' woodpecker (SC)

Numenius americanus - long-billed curlew (SC)

Selasphorus rufus - rufous hummingbird (SC)

Toxostoma lecontei macmillanorum - San Joaquin LeConte's thrasher (SC)

Toxostoma redivivum - California thrasher (SC)

Mammals

Euderma maculatum - spotted bat (SC)

Eumops perotis californicus - greater western mastiff-bat (SC)

Myotis ciliolabrum - small-footed myotis bat (SC)

Myotis evotis - long-eared myotis bat (SC)

Myotis thysanodes - fringed myotis bat (SC)

Myotis volans - long-legged myotis bat (SC)

Onychomys torridus ramona - Southern grasshopper mouse (SC)

Onychomys torridus tularensis - Tulare grasshopper mouse (SC)

Perognathus inornatus - San Joaquin pocket mouse (SC)

FAIRMONT BUTTE (187C)

Species of Concern

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Charadrius montanus - mountain plover (SC)

Cypseloides niger - black swift (SC)

Numenius americanus - long-billed curlew (SC)

LITTLE BUTTES (187D)

Species of Concern

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Charadrius montanus - mountain plover (SC)

Cypseloides niger - black swift (SC)

Numenius americanus - long-billed curlew (SC)

LIEBRE TWINS (188A)

Listed Species

Invertebrates

Branchinecta lynchi - vernal pool fairy shrimp (T)

Amphibians

Rana aurora draytonii - California red-legged frog (T)

Birds

Gymnogyps californianus - California condor (E)

Haliaeetus leucocephalus - bald eagle (T)

Mammals

Vulpes macrotis mutica - San Joaquin kit fox (E)

Species of Concern

Invertebrates

Linderiella occidentalis - California linderiella fairy shrimp (SC)

Plebulina emigdionis - San Emigdio blue butterfly (SC)

Speyeria egleis tehachapina - Tehachapi mountain silverspot butterfly (SC)

Fish

Pogonichthys macrolepidotus - Sacramento splittail (SC)

Amphibians

Batrachoseps stebbinsi - Tehachapi slender salamander (CA)

Spea hammondii (was Scaphiopus h.) - western spadefoot toad (SC)

Reptiles

Charina bottae umbratica - southern rubber boa (CA)

Lichanura trivirgata - rosy boa (SC)

Phrynosoma coronatum frontale - California horned lizard (SC)

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo regalis - ferruginous hawk (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Calypte costae - Costa's hummingbird (SC)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Chaetura vauxi - Vaux's swift (SC)

Charadrius montanus - mountain plover (SC)

Cypseloides niger - black swift (SC)

Falco peregrinus anatum - American peregrine falcon (D)

Lanius ludovicianus - loggerhead shrike (SC)

Melanerpes lewis - Lewis' woodpecker (SC)

Numenius americanus - long-billed curlew (SC)

Selasphorus rufus - rufous hummingbird (SC)

Toxostoma lecontei macmillanorum - San Joaquin LeConte's thrasher (SC)

Toxostoma redivivum - California thrasher (SC)

Mammals

Ammospermophilus nelsoni - San Joaquin (=Nelson's) antelope squirrel (CA)

Dipodomys nitratoides brevinasus - short-nosed kangaroo rat (SC)

Euderma maculatum - spotted bat (SC)

Eumops perotis californicus - greater western mastiff-bat (SC)

Myotis ciliolabrum - small-footed myotis bat (SC)

Myotis evotis - long-eared myotis bat (SC)

Myotis thysanodes - fringed myotis bat (SC)

Myotis volans - long-legged myotis bat (SC)

Onychomys torridus ramona - Southern grasshopper mouse (SC)

Onychomys torridus tularensis - Tulare grasshopper mouse (SC)

Perognathus inornatus - San Joaquin pocket mouse (SC)

NEENACH SCHOOL (188D)

Species of Concern

Birds

Agelaius tricolor - tricolored blackbird (SC)

Athene cunicularia hypugaea - western burrowing owl (SC)

Buteo Swainsoni - Swainson's hawk (CA)

Carduelis lawrencei - Lawrence's goldfinch (SC)

Charadrius montanus - mountain plover (SC)

Cypseloides niger - black swift (SC)

Numenius americanus - long-billed curlew (SC)

County Lists

No county species lists requested.

Key:

- (E) Endangered - Listed (in the Federal Register) as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed (in the Federal Register) for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Marine Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (CA) Listed by the State of California but not by the Fish & Wildlife Service.
- (D) Delisted - Species will be monitored for 5 years.
- (SC) Species of Concern/(SLC) Species of Local Concern - Other species of concern to the Sacramento Fish & Wildlife Office.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7Â½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regard-less of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the quad or quads covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the nine surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

State-Listed Species

If a species has been listed as threatened or endangered by the State of California, but not by us nor by the National Marine Fisheries Service, it will appear on your list as a Species of Concern. However you should contact the California Department of Fish and Game Wildlife and Habitat Data Analysis Branch for official information about these species.

Your Responsibilities Under the Endangered Species Act

All plants and animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR Â§17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our critical habitat page for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able

to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

Your list may contain a section called Species of Concern. This is an informal term that refers to those species that the Sacramento Fish and Wildlife Office believes might be in need of concentrated conservation actions. Such conservation actions vary depending on the health of the populations and degree and types of threats. At one extreme, there may only need to be periodic monitoring of populations and threats to the species and its habitat. At the other extreme, a species may need to be listed as a Federal threatened or endangered species. Species of concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species.

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed, candidate and special concern species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be January 09, 2006.

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Federal Endangered and Threatened Species that may be affected by projects in Los Angeles County

(29 Species)

Key

Type	Common Name	Scientific Name	Status	Date Listed	CH	CH Date	Occurs In
Amphibian	Arroyo toad	Bufo microscaphus californicus	Endangered	16-Dec-94	Proposed		LA
Amphibian	California red-legged frog	Rana aurora draytonii	Threatened	23-May-96	Proposed		LA, MNT, SBA, SBD, SBE, SCZ, SLO, VEN
Bird	Bald Eagle	Haliaeetus leucocephalus	Threatened	11-Mar-67	No		INY, LA, MNO, MNT, SBE, SBR, SCZ, SLO, SBA, VEN
Bird	Brown Pelican	Pelicanus occidentalis	Endangered	02-Jun-70	No		MNT, SCZ, SLO, SBA, VEN
Bird	California condor	Gymnogyps californianus	Endangered	11-Mar-67	Yes	22-Sep-77	KRN, LA, MNT, SLO, SBA
Bird	California gnatcatcher	Polioptila californica	Threatened	30-Mar-93	Proposed		LA, VEN
Bird	California least tern	Sterna antillarum browni	Endangered	02-Jun-70	No		LA, MNT, SBA, SLO, VEN
Bird	Least Bell's vireo	Vireo bellii pusillus	Endangered	02-May-86	Yes	02-Feb-94	INY, KRN, LA, SBA, SBD, SLO, VEN
Bird	Southwestern willow flycatcher	Empidonax trallii extimus	Endangered	27-Feb-95	Yes	22-Jul-97	INY, KRN, LA, SBA, SBD, LA
Bird	Western snowy plover	Charadrius alexandrinus nivosus	Threatened	05-Mar-93	Yes	07-Dec-99	LA, MNT, SBA, SLO
Bird	Yellow-billed cuckoo	Coccyzus americanus	Candidate	25-Jul-01	No		INY, KRN, LA, MNO, MNT, SBA, SBD, SBE, SCZ, SLO, VEN
Fish	Southern California steelhead	Oncorhynchus mykiss	Endangered	17-Jun-98	Proposed		LA, MNT, SBA, SLO, VEN
Fish	Tidewater goby	Eucyclogobius newberryi	Endangered	07-Mar-94	No		LA, MNT, VEN, SBA, SCZ, SLO
Fish	Unarmored threespine stickleback	Gasterosteus aculeatus williamsoni	Endangered	13-Oct-70	No		LA, SBA, VEN
Invertebrate	Quino checker-spot butterfly	Euphydryas editha quino	Endangered	16-Jan-97	No		LA
Invertebrate	Riverside fairy shrimp	Streptocephalus woottoni	Endangered	03-Aug-93	Yes	30-May-01	LA
Mammal	San Joaquin kit fox	Vulpes macrotis mutica	Endangered	11-Mar-67	No		MNT, SBA, SBE, SLO
Plant	Braunton's milk-vetch	Astralagus brauntonii	Endangered	27-Jan-97	No		LA, VEN
Plant	California orcutt grass	Orcuttia californica	Endangered	03-Aug-93	No		LA, SBA, SLO, VEN
Plant	Conejo dudleya	Dudleya abramsii ssp. parva	Threatened	29-Jan-97	No		LA, VEN
Plant	Lyon's pentachaeta	Pentachaeta lyonii	Endangered	29-Jan-97	No		LA, VEN
Plant	Marcescent dudleya	Dudleya cymosa ssp. marcescens	Threatened	29-Jan-97	No		LA, VEN

Plant	Nevin's barberry	Berberis nevinii	Endangered	13-Oct-98	No		LA
Plant	Santa Monica Mountains dudleya	Dudleya cymosa ssp. ovatifolia	Threatened	29-Jan-97	No		VEN, LA
Plant	Slender-horned spineflower	Dodecahema (=Centrostegia) leptoceras	Endangered	28-Sep-87	No		LA, VEN
Plant	Spreading navarretia	Navarretia fossalis	Threatened	13-Oct-98	Proposed	07-Oct-04	LA
Plant	Verity's dudleya	Dudleya verityi	Threatened	29-Jan-97	No		VEN, LA
Reptile	Blunt-nosed leopard lizard	Gambelia silus	Endangered	11-Mar-67	No		LA, SBA, SBD, SBE, SLO, VEN
Reptile	Desert tortoise	Gopherus agassizzii	Threatened	02-Apr-90	Yes	08-Feb-94	INY, KRN, LA, SBD

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Appendix E

Cultural Resources Survey Report

Archaeological Evaluation Report for
The Antelope Valley Water Bank Project
Kern and Los Angeles Counties, California

Prepared for:

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October 2005

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Contents

Figures

Management Summary

Jones & Stokes conducted an archaeological survey and assessment of cultural resources for the Antelope Valley Water Bank Project. This work included a records search, a sample survey of the recovery and recharge basin areas of the Antelope Valley floor, and a complete survey, except for areas of no access, of a proposed pipeline extending south to the California Aqueduct.

In the 1,640 acres of the proposed recharge basins, a 26.83 percent sample was surveyed, consisting of randomly selected 40-acre parcels. Each 40-acre tract was surveyed on foot using 15-meter transects. No cultural resources were located. The pipeline right-of-way was surveyed for a distance of 5.5 miles on to the hillslopes south of the recharge basin area. This survey ended at Avenue F8 because of property access. Two transects were walked for this survey, on the east side of 170th Street, one at the edge of the shoulder and one in agricultural fields 15 meters farther east. No cultural resources were located.

In many areas of the Project, such as the proposed well field and connecting collection pipelines, construction locations and details are not finalized. Therefore, no cultural resources survey has been done in these areas, and further survey will be required when construction locations are determined.

A sample survey in the proposed recharge and recovery basin area located no cultural resources. Based on the setting of this area and its low potential for cultural resources, no further survey is recommended. In the unlikely possibility that prehistoric or historic cultural resources are discovered in this area during construction, all work shall be halted in the vicinity of the archaeological discovery until a qualified archaeologist can visit the site of discovery and assess the significance of the archaeological discovery. Further treatment may be required, including site recordation, excavation, site evaluation, and data recovery.

In the surveyed portions of the proposed connector pipeline to the California Aqueduct, no sites were located. In this area, due to the depth of disturbance associated with the pipeline, and the fact that it crosses low alluvial fans and near stream channels, areas likely to have a high potential for buried cultural resources, cultural resources monitoring is recommended.

In the remainder of areas, when construction details are confirmed as to well and pipeline locations, these areas should be surveyed by a qualified archaeologist, and supplemental survey reports prepared as needed. If cultural resources are located, the Project component may be redesigned to avoid the resource, or the cultural resources treated as described above, that is assessed for significance by a qualified archaeologist; further treatment may include site recordation, excavation, site evaluation, and data recovery.

I. INTRODUCTION AND PROJECT DESCRIPTION

The Project area is located in eastern Kern County and northern Los Angeles County, approximately 10 miles west of the community of Rosamond in Kern County and 17 miles northwest of the City of Lancaster in Los Angeles County. Edwards Air Force Base is located 15 miles to the east of the Project area, and the county line between Kern and Los Angeles Counties is located along the southern edge of the recharge facilities (Figure 1).

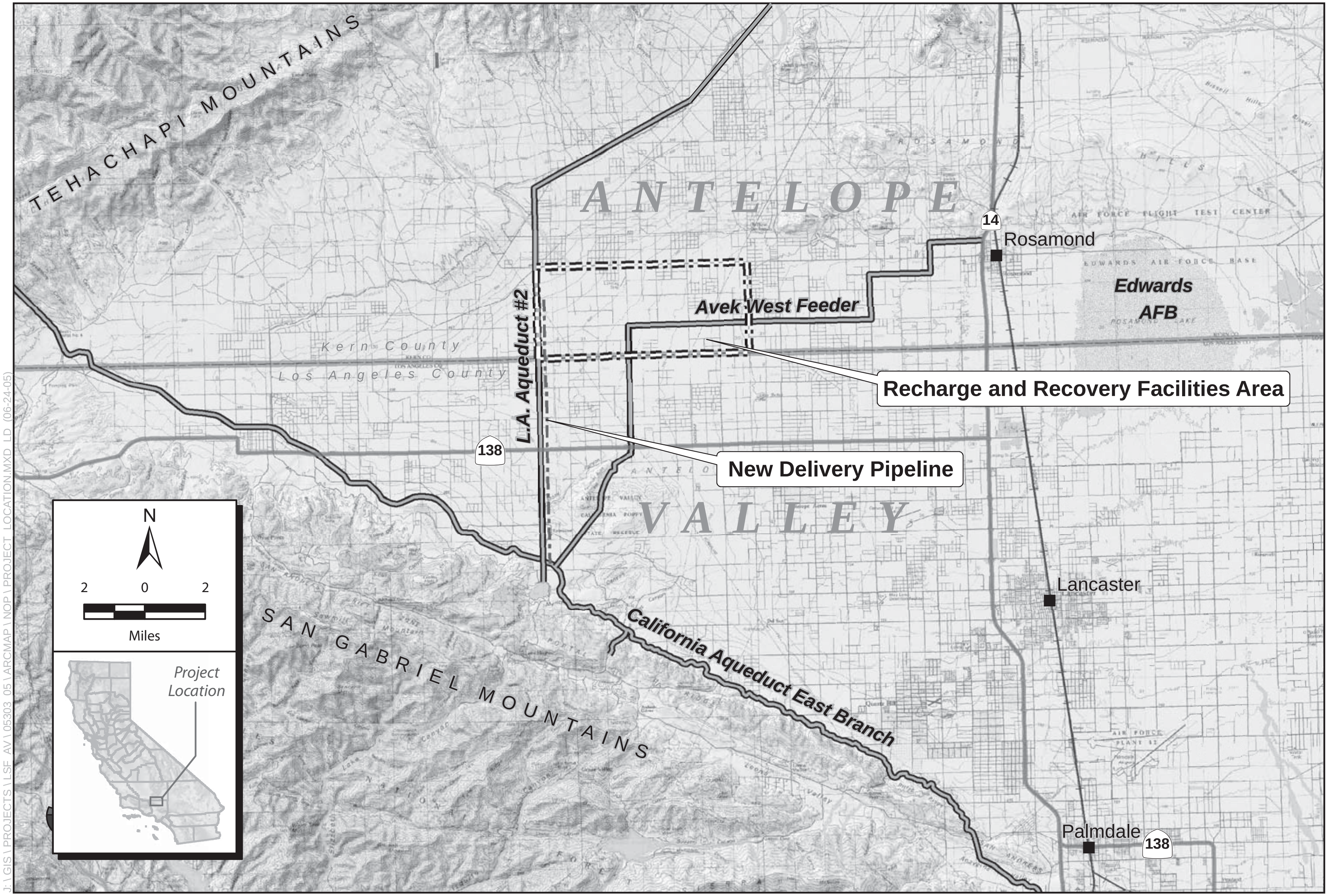
A 21-square-mile area in Kern County is proposed for recharge and recovery. This 21-square-mile area (13,440 acres) is bounded by Rosamond Boulevard to the north, Avenue A to the south (Kern County–Los Angeles County line), 170th Street West to the west, and 100th Street West to the east. Recharge and recovery facilities include a distribution pipeline, local distribution canals and recharge basins, recovery wells, and recovery pipelines. The land in the recharge and recovery area is made up of farmland and undeveloped land. Recharge basins would occupy about 1,500 acres of the recharge and recovery area. An additional 370 acres of the 21-square-mile area would be disturbed for construction of associated distribution canals, peripheral berms, and internal water checks; 3 to 40 acres would be disturbed for well construction; and additional acreage, not currently estimated, would be disturbed for the well piping system.

The area proposed for recharge and recovery facilities is located in the service area of the Antelope Valley East Kern Water Agency (AVEK), which supplies imported State Water Project water to customers via the AVEK West Feeder. The Project area also is crossed by the Los Angeles Aqueduct #2 (LAA#2), which passes just west of the area proposed for recharge basins and runs through Los Angeles County. LAA#2 conveys water from the Owens Valley to Los Angeles.

To expand recharge and recovery capacity, the Project may be connected directly to the California Aqueduct in the future by constructing a new pipeline parallel to LAA #2 on the east shoulder of 170th Street. The connection would occur at the California Aqueduct in Los Angeles County, 7 miles to the south of the recharge and recovery area.

At present, only the recharge basin portion of the Project area is available for cultural resources survey, as are parts of the connector pipeline south of this area. The Project has not yet finalized design of recovery wells and recovery pipelines. For this reason, this report divides the prehistoric and historical cultural resources analysis into areas that have been surveyed for cultural resources and areas that will require survey for cultural resources in the future, as Project facilities are designed and land acquired.

Lands incorporated into the Project area include parts of the Fairmont Butte, Little Buttes, and Lake Hughes 7.5 minute USGS topographic maps, with sections listed on Table 1 below. It must be emphasized as described above that only a small amounts of the total acreage of the area outside of the recharge basin sections will be used for Project construction.



Jones & Stokes

Figure 1
Project Location

Table 1. Sections in Proposed Project Area

Kern County		Los Angeles County	
Township/Range	Sections	Township/Range	Sections
T 9 N, R 15 W	24, 25, 36	T 8 N, R 15 W	1, 12, 13, 24, 25, 36
T 9 N, R14 W	13, 14, 15, 16, 19, 20, 21, 22,	T 7 N, R 15 W	1
	23, 24, 25, 26, 27, 28, 29, 30,		
	31, 32, 33, 34, 35, 36		
T 9 N, R 13 W	30, 31		

II. ENVIRONMENTAL SETTING

The Project area is located in the Antelope Valley, a semiarid region with gently sloping land that borders the Mojave Desert. The west end of Antelope Valley is bounded by the Tehachapi Mountains on the north and the San Gabriel Mountains on the south; these two ranges converge to form a triangular-shaped western end of the valley at the Sierra Pelona Range. The Antelope Valley is a graben—a block of the earth's crust that has dropped down to form a basin as a result of crustal extension and movement on the Garlock fault in the Tehachapi Mountains and the San Andreas fault in the San Gabriel Mountains. Over time the basin has filled with several thousand feet of alluvial materials that have eroded from the surrounding mountain ranges. In particular, ephemeral Cottonwood Creek, emanating from the Tehachapis, continues to deposit a large volume of sands and gravel in a distributary alluvial fan extending into the recharge and recovery area. There are no perennial surface water features. Despite sparse rainfall, the area has been used extensively for agriculture through irrigation with subsurface waters. Ornamental trees are planted densely along some of the fields to provide a wind block.

Elevation in the recharge and recovery facilities area ranges from approximately 2,760 to 2,460 feet above mean sea level. Currently used agriculture fields or open grasslands, many of which appear to have been disturbed by previous plowing or construction, occupy the majority of the Project area. Native vegetation once present in the Project area includes annual grasslands, rabbitbrush scrub, and a small area of Joshua tree woodland. Portions of the Antelope Valley floor adjacent to the Project area that have not been previously disturbed by plowing contain intermittent sand sheet deposits.

III. CULTURAL SETTING

This section provides a general overview of prehistoric, ethnographic, and historical periods in the southern California deserts. The discussion of the prehistoric cultural setting is based primarily on a cultural sequence defined by Warren (1984) for the Mojave Desert.

Prehistoric Setting

Early Man Period

Several sites in the southern California deserts, the most well known of which is Calico Hills, have been tentatively assigned to the "Early Man Period" with relative dates ranging from 12,000 years ago to as far back as 50,000 years ago (Moratto 1984). Various geologic and experimental dating methods provide these extreme temporal assignments. Thus far, however, none of these Early Man sites has withstood scientific scrutiny. Despite claims for evidence of Early Man in the California deserts, it appears likely that humans first arrived in southern California about 12,000 years ago.

Paleo-Indian Period (ca. 12,000–7,000 B.P. [ca. 10,000–5000 B.C.])

The earliest humans to occupy North America were highly mobile hunters and gatherers. Paleo-Indian sites in southern California were assigned by Rogers (1966) to the San Dieguito Culture. Moratto (1984:92) divides assemblages of this early era into a Fluted Point tradition (12,000–10,000 B.P.) and a Western Pluvial Lakes Tradition (10,000–7,000 B.P.). Although a few fluted points have been recovered on the shoreline of Lake Mojave, north of the Project area, few have been documented in the Antelope Valley. For the most part, San Dieguito sites are often found on the margins of dry lakes and on mesas and terraces overlooking large washes. Lake Mojave and Silver Lake points are the typical point types found from this time period.

Pinto Period (ca. 7,000–4,000 B.P. [ca. 5000–2000 B.C.])

The Pinto Period is marked in general by a gradual transition from pluvial to arid conditions during the terminal Pleistocene–Early Holocene. However, at least one period of increased moisture, from approximately 6,500 to 5,500 years ago, resulted in the return of pluvial lake conditions. Warren (1984:414) postulates that human occupation of the southern California deserts approximately 7,000 to 6,500 years ago and from 5,500 to 4,000 years ago may have been limited because of the arid conditions. It is also suggested that the Pinto Period populations withdrew to the desert margins and oases during these arid periods, leaving large portions of the California deserts unoccupied for many centuries. Several sites are known from the Pinto Period in southern California, including sites in Death Valley, Salt Springs, the Stahl Site in Owens Valley, and sites in Pinto Basin near Joshua Tree National Monument. Pinto

Period sites are associated with the margins of pluvial lakes and with now-extinct springs. Pinto-series projectile points, crudely made stemmed or basally notched dart points, are the most distinctive artifact type of the Pinto Period. Other artifacts found at Pinto sites include large leaf-shaped knives, thick, split cobble choppers and scrapers, scraper-planes, and small milling slabs and manos. Most known Pinto Period sites are small surface deposits of lithic artifacts, suggestive of temporary and perhaps seasonal occupation by small groups of people (Warren 1984).

Gypsum Period (ca. 4,000–1,500 B.P. [ca. 2000 B.C. to A.D. 500])

The Gypsum Period is one of cultural intensification in the deserts of southern California. The beginning of this period coincides with the beginning of the Little Pluvial (ca. 2000 B.C.), a period of increased effective moisture in the region that apparently allowed for more intensive occupation of the California deserts. During the succeeding arid periods, it appears that human populations gradually adapted in a variety of technological and socioeconomic ways to the more arid desert environment. A few Gypsum Period sites from the deserts of California, Nevada, and Arizona have been excavated, including Gypsum Cave, Newberry Cave, Willow Beach, Rose Spring, Indian Hill Rockshelter, and Ray, Baird, and Chapman caves.

Diagnostic projectile points of this period include Humboldt, Gypsum, and Elko-series dart points (Warren 1984). Late in the Gypsum Period, Rose Spring arrow points appear in the archaeological record, reflecting the spread of bow and arrow technology. Another technological innovation introduced during this period was the mortar and pestle for processing hard seeds. Other artifact types characteristic of this period include leaf-shaped arrow points, rectangular-based knives, flake scrapers, T-shaped drills, milling slabs and manos, core/cobble tools assemblages such as scraper planes, large choppers, and hammerstones, shaft smoothers, incised slate and sandstone tablets and pendants, and bone awls (Warren 1984). A wide range of perishable items dating to this period were recovered from Newberry Cave, including atlatl hooks, dartshafts and foreshafts, sandals and S-twist cordage, tortoise-shell bowls, and split-twig animal figurines. The presence of both *Haliotis* and *Olivella* shell beads and ornaments and split-twig animal figurines indicates that the California desert occupants were in contact with populations from the Pacific coast and the southern Great Basin of Arizona, Utah, and Nevada.

Saratoga Springs Period (ca. A.D. 500–1200)

This period reflects a continuation of trends begun during the Gypsum Period, including an increasing adaptation to the desert environment and an increase in trade relations (Warren 1984). Variations in regional cultural adaptations during the Saratoga Springs Period also become apparent. Warren (1984) defines four cultural spheres in the Mojave and Colorado Deserts during this period: a northern sphere located north of the Mojave River, a central desert sphere located around the Mojave River, the Antelope Valley sphere, and a southern desert sphere influenced by Hatakayan (Patayan) cultures adjacent to the Colorado River.

In the northern Mojave, the Saratoga Springs Period is marked by the dominance of Rose Spring and Eastgate arrow points over earlier Elko and Humboldt series dart points. Excepting this technological change, there appears to be a strong continuity of the Gypsum Period cultural assemblages in the northwestern Mojave.

In the central Mojave Desert, Anasazi interest in turquoise likely influenced populations living in the Mojave Desert as far west as the Halloran Springs area where hundreds of small turquoise mines existed. Toward the end of the Saratoga Springs Period, the Hakataya people apparently moved far enough north to gain control of the turquoise mines in the central Mojave Desert, thus replacing the Anasazi occupation of the eastern California desert.

In the Antelope Valley and western Mojave Desert, the Saratoga Springs Period is identified by Rose Spring and Cottonwood Triangular projectile points at large village sites containing deep middens and cemeteries that have been dated from 250 B.C. to A.D. 1650 (Sutton 1981:217). These sites also contain large quantities of shell beads and steatite items that originated from southern California coastal regions. It appears that the occupants of Antelope Valley traded heavily with the coastal populations, developed large villages in the Saratoga Springs Period, and represent another divergent regional development during this period.

In the southern desert region, the impetus for change appears to have derived from Hakataya influences from the lower Colorado River, evidenced by the introduction of Buff and Brown Ware pottery and Cottonwood and Desert Side-notched projectile points. The initial date for the first Hakataya influence on the southern Mojave Desert remains unknown; however, it does appear that by A.D. 800–900 the Mojave Sink was heavily influenced, if not occupied, by lower Colorado River peoples (Moratto 1984:423).

Shoshonean Period (ca. A.D. 1200 to 1800)

The formation of distinct ethnographic groups becomes clearer during the Shoshonean Period. In the southern deserts, Brown and Buff Ware pottery, first appearing on the lower Colorado River at about A.D. 800, started to diffuse across the California deserts by about A.D. 900 (Moratto 1984:425). Associated with the diffusion of this pottery were Desert Side-notched and Cottonwood Triangular projectile points dating to about A.D. 1150–1200, suggesting a continued spread of Hakataya influences. Trade along the Mojave River also expanded, resulting in middlemen between coastal and Colorado River populations. Large, complex housepit village sites were established along the headwaters of the Mojave River (Smith 1963) and were somewhat similar to those reported in Antelope Valley (Sutton 1981). Although both of these areas appear to have participated in extensive trade between the desert and the coast, the lack of Buff and Brown Ware pottery at Antelope Valley sites suggests that these people were influenced minimally by the Hakataya developments along the Mojave River (Moratto 1984:426).

In this period, cultural expressions in the northwestern and eastern Mojave appear to have coalesced, forming a single cultural unit that roughly corresponds to the boundary of the Numic speaking peoples. Hakataya influence in this region is marked by Desert Side-notched

and Cottonwood Triangular projectile points and Brown Ware (Moratto 1984:427). This influence appears to have diminished during the late Shoshonean Period when the extensive trade networks along the Mojave River and in Antelope Valley appear to have broken down and the large village sites were abandoned. Subsequently, Spanish exploration and establishment of the Mission system during the late 1700s mark the end of prehistoric lifeways.

Ethnographic Background

The Antelope Valley and adjacent Tehachapi Mountains lie within the traditional cultural territory of the Kitanemuk Native American group, with the western Antelope Valley shared with the Tataviam, Vanyume, and Serrano peoples as well. All of these cultural groups were based in areas outside the western Antelope Valley in the surrounding mountains or along the Mojave River. The Kitanemuk were based primarily in the Tehachapi Mountains and built their villages there, but members of this tribe ranged into the western Antelope Valley during the cooler seasons of the year. Ethnographic sites, as is true with archaeological sites, were tethered to water resources, with streams and springs located in or at the base of mountain and hillslopes supporting villages and other significant use areas. Lithic resources procurement areas were also heavily exploited by the Kitanemuk. Areas such as the Antelope Valley floor were used only sporadically, usually for hunting or gathering, activities that are unlikely to leave much archaeological evidence.

The Kitanemuk spoke a Serran language of the Takic family. Many kinship terms are similar to those in other southern California languages and suggest that the Kitanemuk were organized in a patrilineal structure. Unlike other groups, however, they were not organized into totemic lineages or moieties (Blackburn and Bean 1978). The Kitanemuk were enemies of the Tatavium to the east and the Yokuts in the Central Valley but maintained complex trade and ritual alliances with the Chumash to the west and the Tubatulabal tribe to the north. These complex interactions gave them access to the resources of distant peoples, as well as influencing Kitanemuk mythology and ritual activities (Blackburn and Bean 1978).

The Kitanemuk for the most part were hunting, collecting, and harvesting peoples. Family groups worked in the mountains, foothills, and valleys, providing resources from different ecological niches. Kitanemuk houses were built of wattle and daub to withstand harsh winter weather in the mountains. Temporary shelters of brush were probably built in the desert areas to provide protection from the sun. To gather and prepare food resources, an array of equipment was used. Bows and arrows were the most important hunting tools, but traps, nets, blinds, throwing sticks, and slings were also part of the hunting technology. Gathering required few tools: poles for shaking down pine nuts and acorns, cactus pickers, chia hooks, seed beaters, digging sticks and weights, and pry bars. Materials associated with transportation were used mainly to move food and included burden baskets, carrying nets, and game bags. Some food was stored in large baskets.

Pottery ollas and baskets treated with asphaltum were used to store and carry water and seeds. Wood, clay, and steatite were used to make jars, bowls, and trays. Skin and woven grass

were used to make bags. Food processing required hammers and anvils for cracking nuts; mortars and pestles for grinding acorns; manos and metates for grinding seeds and berries; winnowing shells and baskets; strainers; leaching baskets and bowls; knives of stone, bone, and wood; and bone saws. Basket mortars, with asphaltum used to attach an open-bottomed basket to a mortar, were important for food processing. Food was served in wooden gourd dishes and cups and in basket bowls that were sometimes tarred.

Historic Background

Early Exploration

As early as 1769, the Spanish explored the foothills surrounding the Antelope Valley in the western Mojave Desert. By 1806, two routes led from the desert to the coast: the Old Spanish Trail near Cajon Pass and Owens Valley Road through Tehachapi Pass (Beck and Haase 1974; Guerrero and Komporlides 1995).

One of the first Anglo-Americans to pass through the area was mountain man Jedediah Smith. When he arrived at Mission San Gabriel in 1826, local Mexican officials, suspicious of his intentions, refused permission for him to continue travels in California (Magruder 1950). Despite the governor's command, Smith went north through the Tejon Pass and up the San Joaquin Valley to the Stanislaus River. Kit Carson, one of the trappers in Jedediah Smith's 1828 expedition, was the guide for John C. Fremont's party in 1844. Under Carson's guidance, the party crossed over the Old Spanish Trail, reached the Antelope Valley floor, and subsequently provided the first published descriptions of the regional flora, geography, and geology (Thompson 1929; Goetzmann 1978, 1979 cited in Guerrero and Komporlides 1995).

American Period

From the 1840s through the 1940s, federal and state lands in the Far West were available for private entry by the general public. Private land entry for agricultural settlement occurred by cash purchase, preemption, military service, homesteading, and railroad construction. A national policy for inhabiting unsettled or sparsely populated territories encouraged development of rural agriculture, growth of resource procurement industries, relocation of urban inhabitants to outlying rural areas, and expansion of the national economy (Ross 1998).

Settlement of the western Mojave Desert was motivated by most of the same factors experienced in other western states. However, the region has its own specific environmental and geographic circumstances, and four factors specifically stimulated growth in the region: railroad construction, enactment of Homestead and Desert Land laws, improved irrigation technology, and the development and experimentation of scientific dry-farming techniques (Guerrero and Komporlides 1995).

In 1850, the federal government funded surveys to explore alternative routes for the transcontinental railroad, including two surveys through the central Antelope Valley (Goetzmann 1979 cited in Guerrero and Komporlides 1995). In 1853, Lt. R. S. Williamson led an expedition to explore the passes in the southern Sierra and across the Mojave along the Old Spanish Trail to connect with surveys of the 32nd and 35th parallel routes. In 1854, Lt. Amiel W. Whipple's party surveyed the 35th parallel route from the Mississippi River to the coast. The results of these surveys indicated that the 35th parallel route was the best topographically for railroad construction (Guerrero and Komporlides 1995).

Prior to the arrival of railroads, stagecoach routes brought travelers north from Los Angeles via Tejon Pass to the west of the project area, or traversed Antelope Valley. On such route, known as the Joe Walker Trail or Los Angeles to Havilah route, stopped at Willow Springs, about 20 miles east of the Project area, before proceeding north to the mines in the Kern River area. This stage route passed east of the project area.

Two land grant railroads, the Atlantic and Pacific and the Southern Pacific, and one locally independent line, the California Southern, were catalysts for growth in the Antelope Valley. These railroads established routes from Los Angeles to San Francisco, Mojave to Needles, and San Diego to Barstow. The Southern Pacific Railroad finished its line from San Francisco to Los Angeles via the Antelope Valley in 1876. In 1884, the Southern Pacific line joined the Atchison, Topeka & Santa Fe and completed the line to Needles. Construction of the railroads with accompanying towns and watering stations and the enactment of various laws between 1862 and 1878 for claiming land in the public domain, including the Homestead Act of 1862 and the Desert Land Act of 1877, encouraged population growth in the region (Guerrero and Komporlides 1995; Ross 1998). The community of Rosamond east of the Project area was named for the daughter of a Southern Pacific railroad executive when the town was established in 1877. Rosamond is the nearest location to the project area that is on a rail line.

Colonization and Homesteading

In the 1880s, colonization companies and local boosters spurred a variety of groups to establish colonies in the region, including Quakers, German Lutherans, Scots, English, proponents of Prohibition and Scientific Farming, and Utopian Socialists. During the initial colonization years through 1920, the region faced fluctuating water levels and severe drought years (Guerrero and Komporlides 1995). Despite droughts that caused the failure of numerous colonies, development in the central Antelope Valley became relatively active between 1910 and 1929 (Hensher 1991; Hine 1953 cited in Guerrero and Komporlides 1995).

By 1930, more than 80 towns had been built in the Antelope Valley, many of them located along the railroads. In the vicinity of the Project, the small community of Fairmount was developed around 1910, in Los Angeles County near Fairmont Reservoir. The reservoir is part of the Los Angeles Aqueduct, which was built across the Antelope Valley in 1908–1913. Nearby Willow Springs was developed as a resort in 1904 by the owner of the adjacent Tropico Mine.

In the 1930s, severe drought, compounded by events in the Dust Bowl and an unprecedented worldwide depression, began to impede homesteading efforts severely. The homesteading era ended in 1935 when the remaining public domain was withdrawn from entry (Guerrero and Komporlides 1995).

The focus of the homesteaders' economy in the Antelope Valley was agriculture and ranching. Dry-farming methods were used with some success in the late 1880s and early 1890s when rainfall was unusually plentiful. However, a severe drought between 1893 and 1904 brought the demise of many agricultural pursuits in the Antelope Valley (Guerrero and Komporlides 1995).

Cattle and sheep ranching were profitable largely because of the availability of open range and water. Although cattle grazing in the central Antelope Valley began in the late 1860s, widespread cattle ranching did not begin until 1888, when the Starkey and Butterworth families settled in the Rosamond area. The Butterworth ranch, near Buckhorn Springs, became the largest cattle operation in Antelope Valley. Eventually, the Rosamond area developed into an industrial center for cattle ranching (Guerrero and Komporlides 1995).

Sheep also played an important role in the area's economy. They were more amenable to the arid environment and could spend the winter grazing on desert plants lush enough to preclude the need for a separate, consistent water source. When desert foliage dried, the sheep were driven north along the western edge of the Mojave through Walker Pass and into the basin ranges to graze for the spring and summer (Beck and Haase 1974; Guerrero and Komporlides 1995).

Mining

Mining was an important addition to the economy of the homesteader because it offered the potential of a high return for minimal investment. The development of mining in the central Antelope Valley was the result of mining technology adapted to the desert environment and the availability of rail transportation (Guerrero and Komporlides 1995). Three types of mining were dominant in the Antelope Valley: precious metals mining (gold and silver), common mineral extraction (clay, mud, and borate), and leaseable resources (oil). A mining boom occurred with the discovery of gold by Ezra Hamilton at Tropico Hill just east of Willow Springs in 1894. After Hamilton's initial discovery, others followed in an attempt to establish their fortunes. Thousands of miners filed mining claims in Kramer Hills after gold was discovered there in 1926. Kramer Hills became one of several mining districts developed in the Antelope Valley (Guerrero and Komporlides 1995).

IV. RESEARCH AND PREDICTIVE MODELING

Records Search Results

An area of 77 miles in Kern County and 24 square miles in Los Angeles County was included in the cultural resources literature and records search for this Project. This records search encompassed the 4–square mile area of Kern County designated for the recharge basins, the 26–square mile area that will include the proposed well field, and a buffer zone designed to capture a sample area of the Antelope Valley floor in the Project area. In addition, the records search included a 2-mile-wide strip centered on the proposed pipeline location running south of the recovery and recharge facilities into Los Angles County.

Within the 4 square miles encompassing the proposed recharge basins, no cultural sites or isolated artifacts have been recorded. One survey had been undertaken in the past in this area, a pipeline survey along Avenue A. In the proposed recovery wells and recovery pipelines area, a zone covering 17 square miles, 16 previous surveys totaling 4,340 acres have located two prehistoric sites and six isolated artifacts.

Mid–twentieth century maps were examined for information regarding potential historic-era sites in the recharge ponds portion of the Project; however, no evidence of earlier structures or other historic uses was depicted. The more recent 1965 Fairmont Butte quadrangle map depicts two structures in the recharge ponds area. One of these structures, a now-abandoned house, was built in the late 1950s or early 1960s and is not a historical resource. A second structure depicted on the 1965 quadrangle map has been demolished, and no evidence of it exists on the ground.

In the 18 square miles extending south to the California Aqueduct, 15 cultural sites have been recorded. Seven prehistoric sites are situated a little less than a mile east of 170th Avenue, surrounding Fairmont Butte. This butte, a complex of granite and andesite, is a large prehistoric quarry and camp area recorded as CA-KER-1789, where prehistoric populations were supported by small springs and intermittent streams. The remaining eight sites are from the historic period; one of these, the former town site of Fairmont (CA-RIV-673H), is located just east of the proposed connector pipeline. No structures associated with Fairmont are currently standing, and no historic era structures of any kind occur on the proposed pipeline route in Los Angeles County.

On the portion of the Antelope Valley floor in Los Angeles County adjacent to the proposed Project, four isolated artifacts have been recorded. This pattern supports the pattern seen in Kern County: prehistoric sites occur near water or lithic material sources and not on the un-watered valley floor.

Modeling

To focus cultural resources efforts prior to pedestrian survey, the Project area was assessed for its probability of containing prehistoric cultural resources. Results of the records and literature search area were compared to the Project area in terms of natural setting and known site locations. This comparison included the 39 square miles of the Project records search, and an additional 63–square mile buffer area and sample on the Antelope Valley Floor, for a total of 102 square miles examined.

Four types of terrain were distinguished, based primarily on the proximity of the terrain to water:

1. alluvial fan surfaces with no drainages depicted,

2. alluvial fan slopes with dashed or solid blue line streams,

3. areas at the edges of hillslopes, and

4. areas within 1 mile of springs or lithic sources

Each section in the records search area then was assigned to one of the above categories. This arbitrary use of sections, designed to make the acreage calculations more straightforward, was altered only in the case of springs and known lithic sources, including Fairmont Butte near the connector pipeline. Those areas within 1 mile of a spring or a lithic source were assigned to the spring and lithic sections, regardless of the actual section lines.

The results of this effort are presented on Table 2.

Terrain Type	Acres	Acres Surveyed	Sites	One Site/X Acres
No drainages	*23,040*	2,680	*4*	5,760
Dashed blue line	35,200	3,390	12	2,514
Edge of slopes	3,840	20	2	1,920
Springs and lithics	2,560	680	13	196

This examination of the records search results revealed a clear pattern in prehistoric site locations. In the 102–square mile records search area encompassing the Project and its surroundings, a total of 6,770 acres have been surveyed and 30 sites recorded. Of these, 13 are located within 1 mile of springs or lithic sources, 12 sites are located along or near intermittent stream channels, two are at hillslope interfaces, and three are found on the open valley floor. Dividing the acreage of each terrain type by the number of sites found, it is very clear that the open valley floor has a very low potential to encompass prehistoric sites; water and the presence of lithic materials drew prehistoric occupation and use. It should be mentioned that the sites found near springs and quarry areas are also dramatically larger than those found near intermittent streams or on the open valley floor. The unwatered valley floor does show signs of

prehistoric use, however—nine isolated artifacts, usually single flakes, have been previously recorded in the 23,040 acres of this terrain in the study area.

Sediments in the valley floor portion of the Project area are of Holocene age, that is, less than 10,000 years, and could contain cultural deposits. However, the valley floor appears to have been covered originally with a thin Aeolian sand sheet, 1 to 3 feet thick. This area has been plowed and deep plowed, as well as leveled by machine, to accommodate agriculture. Holocene Age sediments on the valley floor portion of the Project area are estimated to be 5 feet thick. Previous work in southern California has shown that deep plowing and machine leveling can disturb this thickness of sediments and bring prehistoric artifacts to the ground surface (Robinson 2001), making it unlikely that significant prehistoric cultural resources with no surface expression are buried in the thin valley floor sediments.

In contrast, the south slopes of the Antelope Valley are made up of thicker wedges of alluvial fan sediment on the lower slopes between Avenue A and Avenue D, and Older Quaternary alluvium south of Avenue D. Archaeological monitoring work in southern California in similar settings has recovered deeply buried early Holocene sites (McDougall et al. 2003). This setting indicates that this portion of the Project, the location of part of the Phase 2 delivery pipeline, has a moderate potential to contain buried cultural resources. In addition, this area is crossed by several small intermittent streams and is located less than 1 mile east of the extensive lithic quarry site, CA-KER-1789. All of these factors indicate that this portion of the Project area has a moderate sensitivity for buried cultural resources. South of Avenue D, the older Quaternary alluvium is exposed at the surface, with a low potential for buried cultural resources.

Results of the records search and other survey work in the area indicate that the valley floor setting of the Project area has very low potential to encompass prehistoric archaeological sites. Given the large extent of the Project area, and a desire to limit environmental assessment efforts to those likely to be productive, the choice was made to conduct a sample survey of a portion of the Project area. Within the records search area, the majority of recorded sites were located near Willow Springs and Bean Spring, northeast of the Project area, or at the base of the Tehachapi Mountains, northwest of the Project area.

V. FIELD METHODS

Cultural resources survey was conducted for the recharge basins portion of the Project and the pipeline right-of-way location extending south into Los Angeles County to the California Aqueduct. Survey was conducted on June 9, 23, 27, 28, 29, August 26 and 27, and September 2005. Within the 1,640 acres of the proposed recharge basins, a sample survey was conducted. The recharge basin area was divided into 41 forty-acre parcels, using the standard quarter section lines and each parcel assigned a number. Eleven of these parcels, a 26.83 percent sample, were then selected at random for pedestrian survey using a random number generator (Figure 2). Each 40-acre tract was surveyed on foot using 15-meter transects. No cultural resources were located. (Although parcel 35 was selected by random number, the surface visibility was poor in this area because of standing barley and deep weeds; therefore, parcel 36, across the road, was substituted and surveyed.) Visibility in these randomly selected 40-acre parcels ranged from 100 percent in bare plowed areas, to 30 to 40 percent in barley fields and recently harvested hay fields.

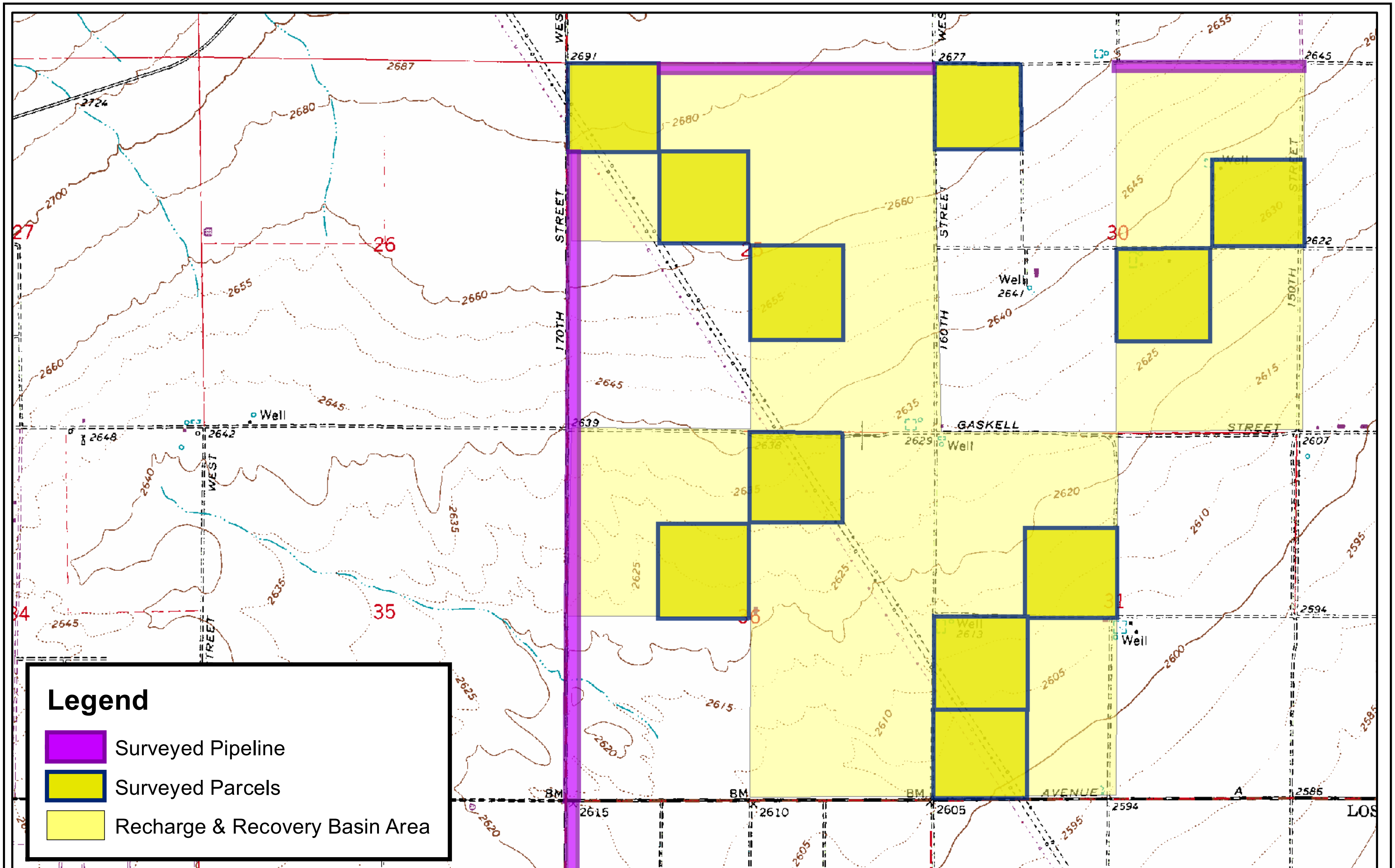
The pipeline right-of-way was surveyed for a distance of 5.5 miles onto the hillslopes south of the recharge basin area. This survey ended at Avenue F8, because of property access (Figures 3 and 4). Two transects were walked for this survey, on the east side of 170th Street, one at the edge of the shoulder and one in agricultural fields 15 meters farther east. Visibility ranged from very low to good. Areas of little visibility were located along the edge of fields that had been previously disturbed and were overgrown with grass and weedy disturbance vegetation. Areas along the pipeline where the ground surface was undisturbed had good visibility, in the range of 70 to 90 percent. No cultural resources were located.

In many areas of the Project, such as the proposed well field and connecting collection pipelines, construction locations and details are not finalized. Therefore, no cultural resources survey has been done in these areas, and further survey will be required when construction locations are determined, as discussed in the mitigation measures below.

VI. RESULTS & RECOMMENDATIONS

The sample survey of the recharge and recovery basin area located no prehistoric or historic-era cultural resources. This result is expected given the desert conditions prevailing in this portion of the Project area and the lack of springs and other surface water. Survey along the accessible portions of the proposed connector pipeline also did not locate any cultural resources.

In areas that have not been surveyed, proposed Project construction locations and details are not finalized. Therefore no cultural resources survey has been done in these areas (i.e., the proposed well field and connecting collection pipelines).

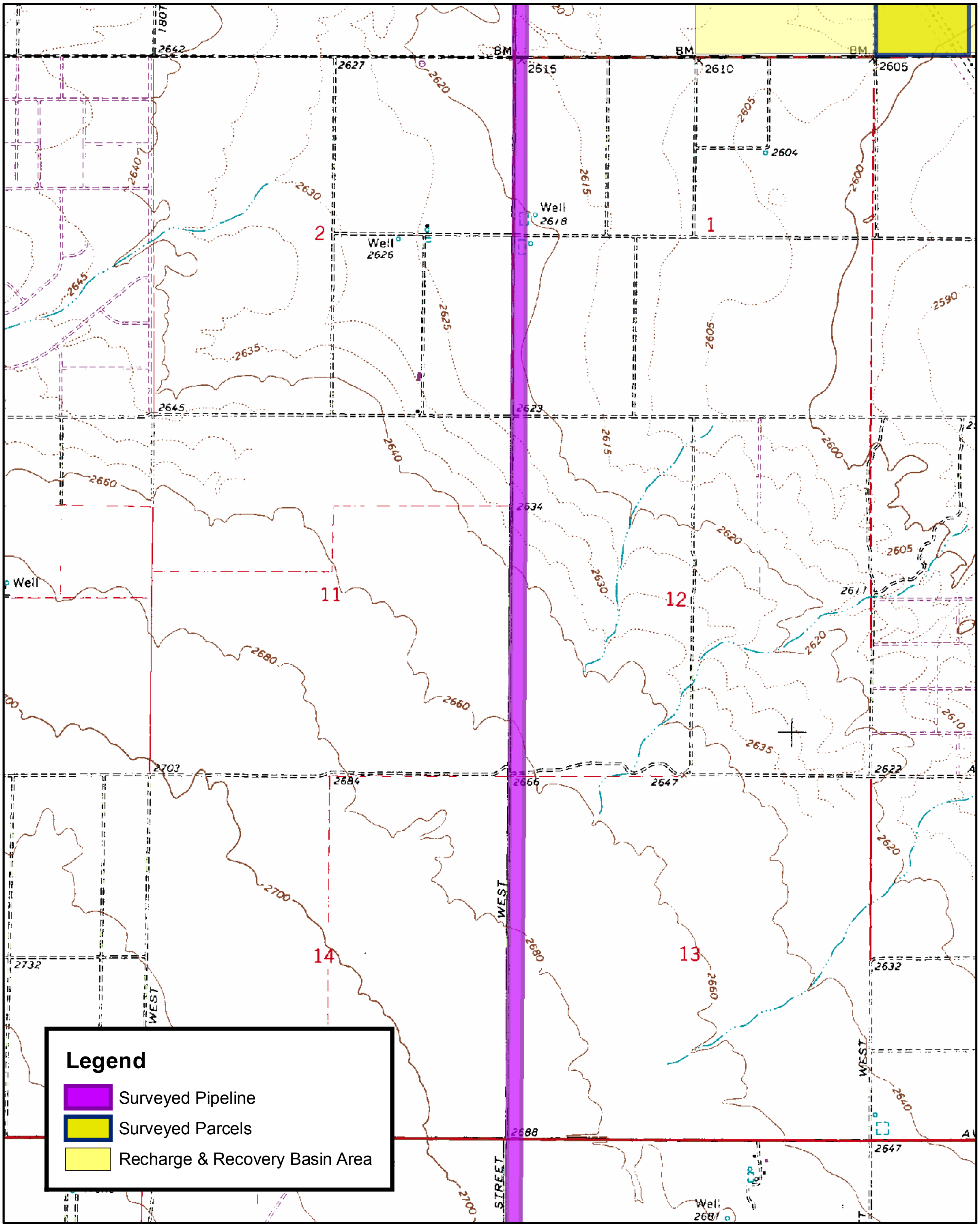


Notes, Source, etc: Fairmont Butte, CA 7.5' USGS Quadrangle

Jones & Stokes

Date: 10/12/2005; GIS\05303_05\Pdf\Figure_2

Figure 2
Surveyed Parcels and Pipeline



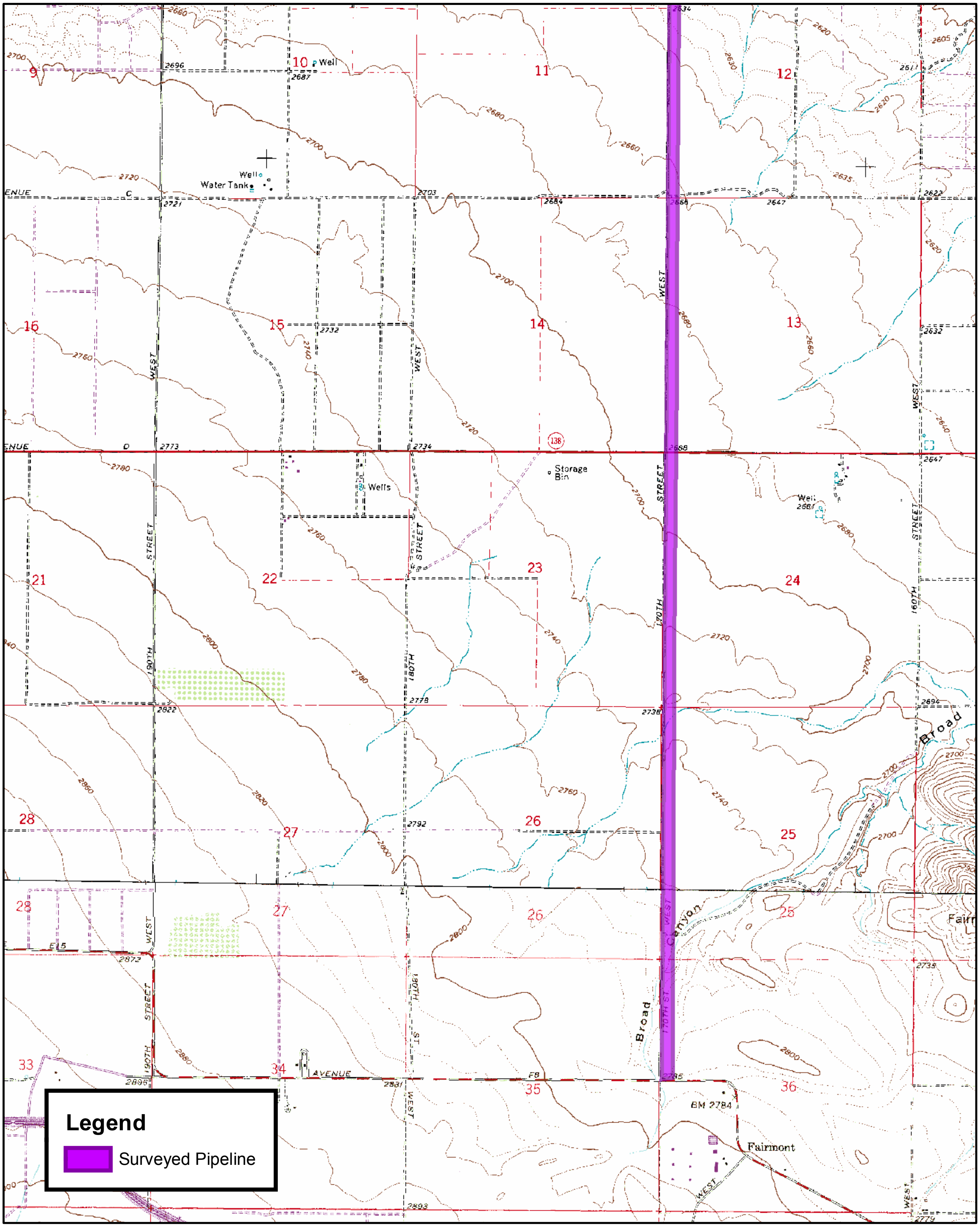
Notes, Source, etc: Fairmont Butte, CA 7.5' USGS Quadrangle

Jones & Stokes

0 2,000 4,000
Feet

Figure 3
Surveyed Pipeline

Date: 10/12/2005; GIS\05303_05\Pdf\Figure_3



Notes, Source, etc: Fairmont Butte, CA and Lake Hughes, CA 7.5' USGS Quadrangles

Jones & Stokes

0 2,000 4,000
Feet

Figure 4
Surveyed Pipeline

Date: 10/12/2005; GIS\05303_05\Pdf\Figure_4

Recommendations

Sample surveys in the proposed recharge and recovery basin area located no cultural resources. Based on the setting of this area and its low potential for cultural resources, no further survey is recommended. In the unlikely possibility that prehistoric or historic cultural resources are discovered in this area during construction, all work shall be halted in the vicinity of the archaeological discovery until a qualified archaeologist can visit the site of discovery and assess the significance of the archaeological discovery. Further treatment may be required, including site recordation, excavation, site evaluation, and data recovery.

In the event of an accidental discovery of any human remains in a location other than a dedicated cemetery, the steps and procedures specified in Health and Safety Code 7050.5, State CEQA Guidelines 15064.5(e), and Public Resources Code 5097.98 shall be implemented.

In the surveyed portions of the proposed connector pipeline to the California Aqueduct, no sites were located. An archaeologist shall monitor all Project-related initial ground-disturbing activities along the proposed Phase 2 delivery pipeline alignment between Avenue A and Avenue D, because of the depth of disturbance associated with the pipeline and the fact that it crosses alluvial fans and near stream channels, areas likely to have a high potential for buried cultural resources. All discoveries shall be documented, and a report of findings prepared and submitted to the Los Angeles County Planning Department and the tribes identified by the Native American Heritage Commission for SB 18 consultation. Archaeological deposits shall be further evaluated for significance according to California Register criteria. Recovery of significant archaeological deposits shall occur using standard archaeological techniques, including but not limited to, manual or mechanical excavations, monitoring, soils testing, photography, mapping, or drawing to adequately recover the scientifically consequential information from and about the archaeological resource. An adequate sample of cultural materials shall be recovered. The applicant shall arrange for permanent curation of artifacts and documents in a repository consistent with the National Park Service guidelines for the curation of archaeological collections (36CFR79).

When construction details are confirmed as to well and pipeline locations, the remaining areas should be surveyed by a qualified archaeologist and supplemental survey reports prepared as needed. The report should include findings and recommendations, if any, for further work to ensure protection of any discoveries. If cultural resources are located, the Project component may be redesigned to avoid the resource, or the cultural resources treated as described above (i.e., assessed for significance by a qualified archaeologist); further treatment may include site recordation, excavation, site evaluation, and data recovery. All reports shall be submitted to the Kern County Planning Department, the Los Angeles County Planning Department, and the tribes identified by the Native American Heritage Commission for SB 18 consultation. All recommendations shall be incorporated into grading and construction plans.

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Acronyms
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Citations
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Tables

Figures

Miscellaneous
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Glossary
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Appendix F

Noise Tables

Appendix F
Introduction

Lynn Wall of Jones and Stokes Associates prepared the tables contained in this appendix using formulas and assumptions developed by the Federal Transportation Administration (FTA 1995). Assumptions regarding the sources of noise are based on the Project Description in Chapter 3 and additional construction and operations details provided by the applicant.

Ms. Wall has 11 years' experience in environmental assessments for air, noise, hazardous material, wastewater, and other environmental issues. She is experienced with noise assessments and noise abatement design projects for transportation projects and has conducted noise-monitoring programs to gather baseline data and to demonstrate post-startup compliance with noise ordinances. She has used a variety of predictive noise models, including TNM for highways.

Table F-1 Noise Levels from Construction Operations

Construction Condition: Site grading	
Source 1: Grader - Sound level (dBA) at 50 feet =	85
Source 2: Scraper - Sound level (dBA) at 50 feet =	89
Average Height of Sources - Hs (ft) =	10
Average Height of Recevier - Hr (ft.) =	5
Ground Type (soft or hard) =	soft
Calculated Data:	
All Sources Combined - Sound level (dBA) at 50 feet =	90
Effective Height (Hs+Hr)/2 =	7.5
Ground factor (G) =	0.62

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)	Calculated Ldn Value (dBA)
50	0	0	90	96
100	-6	-2	83	89
200	-12	-4	75	81
300	-16	-5	70	76
400	-18	-6	67	73
500	-20	-6	64	70
600	-22	-7	62	68
700	-23	-7	60	66
800	-24	-7	59	65
900	-25	-8	58	64
1000	-26	-8	56	62
1200	-28	-9	54	60
1400	-29	-9	53	59
1600	-30	-9	51	57
1800	-31	-10	50	56
2000	-32	-10	49	55
2200	-33	-10	47	53
2800	-35	-11	45	51

Calculations based on FTA 1995.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.

Table F-2 Propane Powered Pump Noise Reference Calculations

Engine Rated Horsepower		466 Hp	
Fuel Type		Propane	Correction Factor B (-3) from Table 7-16 Hoover and Keit
Overall Sound Power	Lw =	**114** dB	where Lw= 92+ 10 LOG(rated Horespower) +A +B+C+D
	Lp @50 ft=	**82** dB at 50 Feet	equation 6-2 page 6-2 Hoover and Keith

Table F-3 Noise Levels from Well Drilling Construction Operations

Construction Condition: Well Drilling	
Source 1: Well Drilling - Sound level (dBA) at 50 feet =	85
	0
Average Height of Sources - Hs (ft) =	10
Average Height of Recevier - Hr (ft.) =	5
Ground Type (soft or hard) =	soft
Calculated Data:	
All Sources Combined - Sound level (dBA) at 50 feet =	85
Effective Height (Hs+Hr)/2 =	7.5
Ground factor (G) =	0.62

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)	Calculated Ldn (dBA)
50	0	0	85	91
100	-6	-2	77	83
200	-12	-4	69	75
300	-16	-5	65	71
400	-18	-6	61	67
500	-20	-6	59	65
600	-22	-7	57	63
700	-23	-7	55	61
800	-24	-7	53	59
900	-25	-8	52	58
1000	-26	-8	51	57
1200	-28	-9	49	55
1400	-29	-9	47	53
1600	-30	-9	46	52
1800	-31	-10	44	50
2000	-32	-10	43	49

Calculations based on FTA 1995.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.

For continuous 24-hour operation Ldn is 6 dB greater than the one hour Leq value.

Table F-4 Noise Levels from Well Pump Operations

Operating Condition: Propane Well pump- 466 Hp	
Source 1: Well Pump - Sound level (dBA) at 50 feet =	82
	0
Average Height of Sources - Hs (ft) =	4
Average Height of Recevier - Hr (ft.) =	5
Ground Type (soft or hard) =	soft
Calculated Data:	
All Sources Combined - Sound level (dBA) at 50 feet =	82
Effective Height (Hs+Hr)/2 =	4.5
Ground factor (G) =	0.66

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)	Calculated Ldn
50	0	0	82	88
100	-6	-2	74	80
200	-12	-4	66	72
300	-16	-5	61	67
400	-18	-6	58	64
500	-20	-7	55	61
600	-22	-7	53	59
700	-23	-8	52	58
800	-24	-8	50	56
900	-25	-8	49	55
1000	-26	-9	47	53
1200	-28	-9	45	51
1400	-29	-10	44	50
1600	-30	-10	42	48
1800	-31	-10	41	47
2000	-32	-11	39	45

Calculations based on FTA 1995.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.

Table F-5 Noise Levels from Lift Station Pump Operations

Operating Condition: Propane Lift Station pump 5041 Hp	
Source 1: Well Pump - Sound level (dBA) at 50 feet =	92
	0
Average Height of Sources - Hs (ft) =	4
Average Height of Recevier - Hr (ft.) =	5
Ground Type (soft or hard) =	soft
Calculated Data:	
All Sources Combined - Sound level (dBA) at 50 feet =	92
Effective Height (Hs+Hr)/2 =	4.5
Ground factor (G) =	0.66

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)	Calculated Ldn (dBA)
50	0	0	92	98
100	-6	-2	84	90
200	-12	-4	76	82
300	-16	-5	71	77
400	-18	-6	68	74
500	-20	-7	65	71
600	-22	-7	63	69
700	-23	-8	62	68
800	-24	-8	60	66
900	-25	-8	59	65
1000	-26	-9	57	63
1200	-28	-9	55	61
1400	-29	-10	54	60
1600	-30	-10	52	58
1800	-31	-10	51	57
2000	-32	-11	49	55
2800	-35	-12	45	51

Calculations based on FTA 1995.

Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.

For continuous 24-hour operation Ldn is 6 dB greater than the one hour Leq value.

Table F-6 Propane Powered Lift Station Pump Noise Reference Calculations

Engine Rated Horsepower		5014	Hp	
Fuel Type		Propane		
Correction Factor B		(-3)		from Table 7-16 Hoover and Keith
Overall Sound Power	Lw =	**124**	dB	where Lw= 92+ 10 LOG(rated Horespower) +A +B+C+D
	Lp @50 ft=	**92**	dB at 50 Feet	equation 6-2 page 6-2 Hoover and Keith

Appendix G
Environmental Data Report

EDR DataMap™
Area Study

Antelope Valley Water Bank Project
Kern/LA County, CA 93536

July 20, 2005

Inquiry number 01468999.1r

EDR™ Environmental Data Resources Inc

The Standard in Environmental Risk Management Information

440 Wheelers Farms Road
Milford, Connecticut 06460

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc. (EDR).

TARGET PROPERTY INFORMATION

ADDRESS

KERN/LA COUNTY, CA
KERN/LA COUNTY, CA

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records within the requested search area for the following databases:

FEDERAL ASTM STANDARD

NPL	National Priority List
Proposed NPL	Proposed National Priority List Sites
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP	CERCLIS No Further Remedial Action Planned
CORRACTS	Corrective Action Report
RCRA-TSDF	Resource Conservation and Recovery Act Information
RCRA-LQG	Resource Conservation and Recovery Act Information
RCRA-SQG	Resource Conservation and Recovery Act Information
ERNS	Emergency Response Notification System

STATE ASTM STANDARD

AWP	Annual Workplan Sites
Cal-Sites	Calsites Database
CHMIRS	California Hazardous Material Incident Report System
Cortese	"Cortese" Hazardous Waste & Substances Sites List
Notify 65	Proposition 65 Records
Toxic Pits	Toxic Pits Cleanup Act Sites
SWF/LF	Solid Waste Information System
WMUDS/SWAT	Waste Management Unit Database
LUST	Geotracker's Leaking Underground Fuel Tank Report
CA BOND EXP. PLAN	Bond Expenditure Plan
VCP	Voluntary Cleanup Program Properties
INDIAN UST	Underground Storage Tanks on Indian Land
INDIAN LUST	Leaking Underground Storage Tanks on Indian Land
CA FID UST	Facility Inventory Database

FEDERAL ASTM SUPPLEMENTAL

CONSENT	Superfund (CERCLA) Consent Decrees

EXECUTIVE SUMMARY

ROD	Records Of Decision
Delisted NPL	National Priority List Deletions
FINDS	Facility Index System/Facility Identification Initiative Program Summary Report
HMIRS	Hazardous Materials Information Reporting System
MLTS	Material Licensing Tracking System
MINES	Mines Master Index File
NPL Liens	Federal Superfund Liens
PADS	PCB Activity Database System
UMTRA	Uranium Mill Tailings Sites
US ENG CONTROLS	Engineering Controls Sites List
ODI	Open Dump Inventory
FUDS	Formerly Used Defense Sites
DOD	Department of Defense Sites
INDIAN RESERV	Indian Reservations
RAATS	RCRA Administrative Action Tracking System
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
SSTS	Section 7 Tracking Systems
FTTS INSP	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

STATE OR LOCAL ASTM SUPPLEMENTAL

AST	Aboveground Petroleum Storage Tank Facilities
CLEANERS	Cleaner Facilities
CA WDS	Waste Discharge System
DEED	Deed Restriction Listing
NFE	Properties Needing Further Evaluation
SCH	School Property Evaluation Program
WIP	Well Investigation Program Case List
EMI	Emissions Inventory Data
REF	Unconfirmed Properties Referred to Another Agency
NFA	No Further Action Determination
SLIC	Statewide SLIC Cases

EDR PROPRIETARY HISTORICAL DATABASES

Coal Gas	Former Manufactured Gas (Coal Gas) Sites

BROWNFIELDS DATABASES

US BROWNFIELDS	A Listing of Brownfields Sites
US INST CONTROL	Sites with Institutional Controls
VCP	Voluntary Cleanup Program Properties

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified.

Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

STATE ASTM STANDARD

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the State Water Resources Control Board's Hazardous Substance Storage Container Database.

A review of the UST list, as provided by EDR, and dated 04/12/2005 has revealed that there are 2 UST sites within the searched area.

Site	Address	Map ID	Page
WIL MAR FARMS	1747 100TH ST WEST	2	3
WEAVER RANCH	100TH W/GASKELL RD	3	3

HIST UST: Historical UST Registered Database.

A review of the HIST UST list, as provided by EDR, and dated 10/15/1990 has revealed that there is 1 HIST UST site within the searched area.

Site	Address	Map ID	Page
LANCASTER RANCHES INC	150TH ST WEST / GASKE	4	4

STATE OR LOCAL ASTM SUPPLEMENTAL

HAZNET: The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000-1,000,000 annually, representing approximately 350,000-500,000 shipments. Data from non-California manifests & continuation sheets are not included at the present time. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, & disposal method. The source is the Department of Toxic Substance Control is the agency

A review of the HAZNET list, as provided by EDR, and dated 12/31/2002 has revealed that there is 1 HAZNET site within the searched area.

Site	Address	Map ID	Page
ORANIC CHOICE LTD	12622 HOLIDAY AVE	1	3

EXECUTIVE SUMMARY

Please refer to the end of the findings report for unmapped orphan sites due to poor or inadequate address information.

MAP FINDINGS SUMMARY

Database	Total Plotted
FEDERAL ASTM STANDARD	
NPL	0
Proposed NPL	0
CERCLIS	0
CERC-NFRAP	0
CORRACTS	0
RCRA TSD	0
RCRA Lg. Quan. Gen.	0
RCRA Sm. Quan. Gen.	0
ERNS	0
STATE ASTM STANDARD	
AWP	0
Cal-Sites	0
CHMIRS	0
Cortese	0
Notify 65	0
Toxic Pits	0
State Landfill	0
WMUDS/SWAT	0
LUST	0
CA Bond Exp. Plan	0
UST	2
VCP	0
INDIAN UST	0
INDIAN LUST	0
CA FID UST	0
HIST UST	1
FEDERAL ASTM SUPPLEMENTAL	
CONSENT	0
ROD	0
Delisted NPL	0
FINDS	0
HMIRS	0
MLTS	0
MINES	0
NPL Liens	0
PADS	0
UMTRA	0
US ENG CONTROLS	0
ODI	0
FUDS	0
DOD	0
INDIAN RESERV	0
RAATS	0

MAP FINDINGS SUMMARY

Database	Total Plotted
TRIS	0
TSCA	0
SSTS	0
FTTS	0

STATE OR LOCAL ASTM SUPPLEMENTAL

Database	Total Plotted
AST	0
CLEANERS	0
CA WDS	0
DEED	0
NFE	0
SCH	0
WIP	0
EMI	0
REF	0
NFA	0
SLIC	0
HAZNET	1
Los Angeles Co. HMS	0
LA Co. Site Mitigation	0
AOCONCERN	0

EDR PROPRIETARY HISTORICAL DATABASES

Database	Total Plotted
Coal Gas	0

BROWNFIELDS DATABASES

Database	Total Plotted
US BROWNFIELDS	0
US INST CONTROL	0
VCP	0

NOTES:

Sites may be listed in more than one database

Map ID Direction Distance Distance (ft.)	Site	Database(s)	EDR ID Number EPA ID Number

Coal Gas Site Search: No site was found in a search of Real Property Scan's ENVIROHAZ database.

1	**ORANIC CHOICE LTD** **12622 HOLIDAY AVE** **ROSAMOND, CA 93560**	**HAZNET**	**S105092981** **N/A**

HAZNET:

Gepaid:	CAL000214978
TSD EPA ID:	AZC980813022
Gen County:	Kern
Tsd County:	99
Tons:	.0000
Waste Category:	Waste oil and mixed oil
Disposal Method:	Recycler
Contact:	MIKE DUNCAN
Telephone:	(661) 845-2296
Mailing Address:	12000 MAIN ST LAMONT, CA 93241
County	Kern

2	**WIL MAR FARMS** **1747 100TH ST WEST** **ROSAMOND, CA 93560**	**UST**	**U003993525** **N/A**

UST Kern County:

Owner Id:	550074
Owner Name:	KECK, WILLIAM III
Tank Num:	0
Tank Capacity:	Not reported
Compliant :	Not reported
APN :	Not reported
Active Facility :	No
Bakersfield City :	No
Common Name :	Not reported
Tank Do:	Not reported

3	**WEAVER RANCH** **100TH W/GASKELL RD** **ROSAMOND, CA 93560**	**UST**	**U003993484** **N/A**

UST Kern County:

Owner Id:	550062
Owner Name:	WEAVER, LESLIE
Tank Num:	0
Tank Capacity:	Not reported
Compliant :	Not reported
APN :	Not reported
Active Facility :	No
Bakersfield City :	No
Common Name :	Not reported
Tank Do:	Not reported

Map ID Direction Distance Distance (ft.)	Site	Database(s)	EDR ID Number EPA ID Number
4	**LANCASTER RANCHES INC** **150TH ST WEST / GASKELL RD** **ROSAMOND, CA 93560**	**HIST UST**	**U001587134** **N/A**

UST HIST:

Facility ID:	38704	Owner Name:	LANCASTER RANCHES INC
Total Tanks:	2	Region:	STATE
Owner Address:	8320 W AVE D LANCASTER, CA 93534		
Tank Used for:	PRODUCT		
Tank Num:	1	Container Num:	2
Tank Capacity:	00001000	Year Installed:	1965
Type of Fuel:	DIESEL	Tank Construction:	Not Reported
Leak Detection:	Stock Inventor		
Contact Name:	ROLLINS PET	Telephone:	(805) 942-6400
Facility Type:	Other	Other Type:	RANCH

Facility ID:	38704	Owner Name:	LANCASTER RANCHES INC
Total Tanks:	2	Region:	STATE
Owner Address:	8320 W AVE D LANCASTER, CA 93534		
Tank Used for:	PRODUCT		
Tank Num:	2	Container Num:	1
Tank Capacity:	00001000	Year Installed:	1965
Type of Fuel:	REGULAR	Tank Construction:	Not Reported
Leak Detection:	Stock Inventor		
Contact Name:	ROLLINS PET	Telephone:	(805) 942-6400
Facility Type:	Other	Other Type:	RANCH

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
LANCASTER	1007200748	OSO PUMPING PLANT	HWY 138 AND 300 ST WEST	93536	RCRA-SQG
LANCASTER	S106826009	ANTELOPE VALLEY COLLEGE	3041 W AV K	93536	EMI
LANCASTER	S105628525	MIDDLE SCHOOL #21 (PROPOSED)	AVENUE K-4/22ND STREET WEST	93536	SCH
LANCASTER	S105628537	AVENUE N SCHOOL	AVENUE N/35TH STREET WEST	93536	SCH
LANCASTER	S106895128	MIDDLE SCHOOL SITE NO. 24	AVENUE H-8/40TH STREET WEST	93536	SCH
LANCASTER	S106568248	RETIREMENT HOUSING FOUND., MAYFLOWER	6570 WEST AVENUE, L-12	93536	VCP
LANCASTER	S105087155	WASHINGTON MUTUAL BANK	805 LANCASTER AVE	93536	HAZNET
ROSAMOND	U003992540	JIM GOLTCHE PROPERTY	110 W 130 W ROSAMOND BLVD	93560	UST
ROSAMOND	U001587135	NORTHROP CORPORATION, ADVANCED	170TH STREET WEST, ROSAMOND BO	93560	HIST UST
ROSAMOND	1000483119	OSAGE INDUSTRIES, 60TH STREET WEST	60TH STREET WEST T9N,R13W,S10 SE CORNER	93560	Cal-Sites, AWP
ROSAMOND	1002850166	OSAGE INDUSTRIES	60TH WEST	93560	CERC-NFRAP
ROSAMOND	U001595283	PACIFIC BELL (SA-064)	W/S GLENDOWNER 279 N/O WILLOW	93560	HIST UST
ROSAMOND	U003993105	ROSAMOND AIRPORT	ROSAMOND AIRPORT	93560	UST
ROSAMOND	S100714218	SWEETSER ROAD UNAUTHORIZED DISPOSAL SITE	SWEETSER RD NEAR HWY 14 / FRONTAGE RD	93560	REF
ROSAMOND	S105964526	GRIMMWAY FARMS COMPOSTING -LANCASTER	TEHACHAPIWILLOWSP. RD. 1.5 S. BACKUS RD.	93560	SWF/LF
ROSAMOND	1003879424	AVENUE A	1/2 MI W OF W 10TH ST ALONG AVENUE A	93560	CERC-NFRAP
SANDBERG	1000250314	PACIFIC BELL	HWY 138 QUAIL LAKE 3 MILES NORTH OF	93532	RCRA-SQG, FINDS
TROPICO	S106079116	TROPICO BD	NW/4, SE/4, SEC 11, T9N, R13W	93560	SWF/LF

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Elapsed ASTM days: Provides confirmation that this EDR report meets or exceeds the 90-day updating requirement of the ASTM standard.

FEDERAL ASTM STANDARD RECORDS

NPL: National Priority List
Source: EPA
Telephone: N/A
National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 04/28/05
Date Made Active at EDR: 05/16/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 05/04/05
Elapsed ASTM days: 12
Date of Last EDR Contact: 05/04/05

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 6
Telephone: 214-655-6659

EPA Region 8
Telephone: 303-312-6774

Proposed NPL: Proposed National Priority List Sites
Source: EPA
Telephone: N/A

Date of Government Version: 04/27/05
Date Made Active at EDR: 05/16/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 05/04/05
Elapsed ASTM days: 12
Date of Last EDR Contact: 05/04/05

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
Source: EPA
Telephone: 703-413-0223
CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 02/15/05
Date Made Active at EDR: 04/06/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 03/22/05
Elapsed ASTM days: 15
Date of Last EDR Contact: 03/22/05

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned
Source: EPA
Telephone: 703-413-0223
As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. EPA has removed approximately 25,000 NFRAP sites to lift the unintended barriers to the redevelopment of these properties and has archived them as historical records so EPA does not needlessly repeat the investigations in the future. This policy change is part of the EPA's Brownfields Redevelopment Program to help cities, states, private investors and affected citizens to promote economic redevelopment of unproductive urban sites.

Date of Government Version: 03/22/05
Date Made Active at EDR: 04/06/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 04/01/05
Elapsed ASTM days: 5
Date of Last EDR Contact: 04/01/05

CORRACTS: Corrective Action Report
Source: EPA
Telephone: 800-424-9346
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/29/05
Date Made Active at EDR: 05/16/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 04/11/05
Elapsed ASTM days: 35
Date of Last EDR Contact: 03/07/05

RCRA: Resource Conservation and Recovery Act Information
Source: EPA
Telephone: 800-424-9346
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS). The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month. Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator off-site to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 05/20/05
Date Made Active at EDR: 06/09/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 05/24/05
Elapsed ASTM days: 16
Date of Last EDR Contact: 05/24/05

ERNS: Emergency Response Notification System
Source: National Response Center, United States Coast Guard
Telephone: 202-260-2342
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 12/31/04
Date Made Active at EDR: 03/24/05
Database Release Frequency: Annually
Date of Data Arrival at EDR: 01/27/05
Elapsed ASTM days: 56
Date of Last EDR Contact: 04/25/05

FEDERAL ASTM SUPPLEMENTAL RECORDS

BRS: Biennial Reporting System
Source: EPA/NTIS
Telephone: 800-424-9346
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/01/01
Database Release Frequency: Biennially
Date of Last EDR Contact: 04/15/05
Date of Next Scheduled EDR Contact: 06/13/05

CONSENT: Superfund (CERCLA) Consent Decrees
Source: Department of Justice, Consent Decree Library
Telephone: Varies
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/14/04
Database Release Frequency: Varies
Date of Last EDR Contact: 04/26/05
Date of Next Scheduled EDR Contact: 07/25/05

ROD: Records Of Decision
Source: EPA
Telephone: 703-416-0223
Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 03/07/05
Database Release Frequency: Annually
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

DELISTED NPL: National Priority List Deletions
Source: EPA
Telephone: N/A
The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 04/28/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 05/04/05
Date of Next Scheduled EDR Contact: 08/01/05

FINDS: Facility Index System/Facility Identification Initiative Program Summary Report
Source: EPA
Telephone: N/A
Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 04/11/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

HMIRS: Hazardous Materials Information Reporting System
Source: U.S. Department of Transportation
Telephone: 202-366-4555
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/31/04
Database Release Frequency: Annually
Date of Last EDR Contact: 04/19/05
Date of Next Scheduled EDR Contact: 07/18/05

MLTS: Material Licensing Tracking System
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/14/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

MINES: Mines Master Index File
Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 02/11/05
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 03/30/05
Date of Next Scheduled EDR Contact: 06/27/05

NPL LIENS: Federal Superfund Liens
Source: EPA
Telephone: 202-564-4267
Federal Superfund Liens. Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/91
Database Release Frequency: No Update Planned

Date of Last EDR Contact: 02/22/05
Date of Next Scheduled EDR Contact: 05/23/05

PADS: PCB Activity Database System
Source: EPA
Telephone: 202-564-3887
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 03/30/05
Database Release Frequency: Annually

Date of Last EDR Contact: 05/10/05
Date of Next Scheduled EDR Contact: 08/08/05

DOD: Department of Defense Sites
Source: USGS
Telephone: 703-692-8801
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 10/01/03
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 02/08/05
Date of Next Scheduled EDR Contact: 05/09/05

UMTRA: Uranium Mill Tailings Sites
Source: Department of Energy
Telephone: 505-845-0011
Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized. In 1978, 24 inactive uranium mill tailings sites in Oregon, Idaho, Wyoming, Utah, Colorado, New Mexico, Texas, North Dakota, South Dakota, Pennsylvania, and on Navajo and Hopi tribal lands, were targeted for cleanup by the Department of Energy.

Date of Government Version: 12/29/04
Database Release Frequency: Varies

Date of Last EDR Contact: 03/22/05
Date of Next Scheduled EDR Contact: 06/20/05

ODI: Open Dump Inventory
Source: Environmental Protection Agency
Telephone: 800-424-9346
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/85
Database Release Frequency: No Update Planned

Date of Last EDR Contact: 05/23/95
Date of Next Scheduled EDR Contact: N/A

FUDS: Formerly Used Defense Sites
Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/03
Database Release Frequency: Varies
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

INDIAN RESERV: Indian Reservations
Source: USGS
Telephone: 202-208-3710
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 10/01/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 02/08/05
Date of Next Scheduled EDR Contact: 05/09/05

US ENG CONTROLS: Engineering Controls Sites List
Source: Environmental Protection Agency
Telephone: 703-603-8867
A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 01/10/05
Database Release Frequency: Varies
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

RAATS: RCRA Administrative Action Tracking System
Source: EPA
Telephone: 202-564-4104
RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/95
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 03/07/05
Date of Next Scheduled EDR Contact: 06/06/05

TRIS: Toxic Chemical Release Inventory System
Source: EPA
Telephone: 202-566-0250
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/02
Database Release Frequency: Annually
Date of Last EDR Contact: 03/22/05
Date of Next Scheduled EDR Contact: 06/20/05

TSCA: Toxic Substances Control Act
Source: EPA
Telephone: 202-260-5521
Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/02
Database Release Frequency: Every 4 Years
Date of Last EDR Contact: 04/05/05
Date of Next Scheduled EDR Contact: 06/06/05

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: EPA
Telephone: 202-566-1667

Date of Government Version: 04/13/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 03/21/05
Date of Next Scheduled EDR Contact: 06/20/05

SSTS: Section 7 Tracking Systems
Source: EPA
Telephone: 202-564-4203
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/03
Database Release Frequency: Annually
Date of Last EDR Contact: 04/19/05
Date of Next Scheduled EDR Contact: 07/18/05

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/13/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 03/21/05
Date of Next Scheduled EDR Contact: 06/20/05

STATE OF CALIFORNIA ASTM STANDARD RECORDS

AWP: Annual Workplan Sites
Source: California Environmental Protection Agency
Telephone: 916-323-3400
Known Hazardous Waste Sites. California DTSC's Annual Workplan (AWP), formerly BEP, identifies known hazardous substance sites targeted for cleanup.

Date of Government Version: 05/04/05
Date Made Active at EDR: 06/29/05
Database Release Frequency: Annually
Date of Data Arrival at EDR: 06/01/05
Elapsed ASTM days: 28
Date of Last EDR Contact: 06/01/05

CAL-SITES: Calsites Database
Source: Department of Toxic Substance Control
Telephone: 916-323-3400
The Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database.

Date of Government Version: 05/04/05
Date Made Active at EDR: 06/29/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 06/01/05
Elapsed ASTM days: 28
Date of Last EDR Contact: 06/01/05

CHMIRS: California Hazardous Material Incident Report System
Source: Office of Emergency Services
Telephone: 916-845-8400
California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).

Date of Government Version: 12/31/03
Date Made Active at EDR: 06/25/04
Database Release Frequency: Varies
Date of Data Arrival at EDR: 05/18/04
Elapsed ASTM days: 38
Date of Last EDR Contact: 02/23/05

CORTESE: "Cortese" Hazardous Waste & Substances Sites List
Source: CAL EPA/Office of Emergency Information
Telephone: 916-323-9100
The sites for the list are designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (Cal-Sites). This listing is no longer updated by the state agency.

Date of Government Version: 04/01/01
Date Made Active at EDR: 07/26/01
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 05/29/01
Elapsed ASTM days: 58
Date of Last EDR Contact: 04/25/05

NOTIFY 65: Proposition 65 Records
Source: State Water Resources Control Board
Telephone: 916-445-3846
Proposition 65 Notification Records. NOTIFY 65 contains facility notifications about any release which could impact drinking water and thereby expose the public to a potential health risk.

Date of Government Version: 10/21/93
Date Made Active at EDR: 11/19/93
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 11/01/93
Elapsed ASTM days: 18
Date of Last EDR Contact: 04/18/05

TOXIC PITS: Toxic Pits Cleanup Act Sites
Source: State Water Resources Control Board
Telephone: 916-227-4364
Toxic PITS Cleanup Act Sites. TOXIC PITS identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

Date of Government Version: 07/01/95
Date Made Active at EDR: 09/26/95
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 08/30/95
Elapsed ASTM days: 27
Date of Last EDR Contact: 02/01/05

SWF/LF (SWIS): Solid Waste Information System
Source: Integrated Waste Management Board
Telephone: 916-341-6320
Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 06/13/05
Date Made Active at EDR: 07/15/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 06/14/05
Elapsed ASTM days: 31
Date of Last EDR Contact: 06/14/05

WMUDS/SWAT: Waste Management Unit Database
Source: State Water Resources Control Board
Telephone: 916-227-4448
Waste Management Unit Database System. WMUDS is used by the State Water Resources Control Board staff and the Regional Water Quality Control Boards for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections Information, Waste Management Unit Information, SWAT Program Information, SWAT Report Summary Information, SWAT Report Summary Data, Chapter 15 (formerly Subchapter 15) Information, Chapter 15 Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information, and Interested Parties Information.

Date of Government Version: 04/01/00
Date Made Active at EDR: 05/10/00
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 04/10/00
Elapsed ASTM days: 30
Date of Last EDR Contact: 03/07/05

LUST: Geotracker’s Leaking Underground Fuel Tank Report
Source: State Water Resources Control Board
Contact: Los Angeles County Public Works, (626) 458-3511
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 05/12/05
Date Made Active at EDR: 06/07/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 05/12/05
Elapsed ASTM days: 26
Date of Last EDR Contact: 04/13/05

LUST REG 1: Active Toxic Site Investigation
Source: California Regional Water Quality Control Board North Coast (1)
Telephone: 707-576-2220
Del Norte, Humboldt, Lake, Mendocino, Modoc, Siskiyou, Sonoma, Trinity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/01	Date of Data Arrival at EDR: 02/28/01
Date Made Active at EDR: 03/29/01	Elapsed ASTM days: 29
Database Release Frequency: No Update Planned	Date of Last EDR Contact: 02/23/05

LUST REG 2: Fuel Leak List
Source: California Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457

Date of Government Version: 09/30/04	Date of Data Arrival at EDR: 10/20/04
Date Made Active at EDR: 11/19/04	Elapsed ASTM days: 30
Database Release Frequency: Quarterly	Date of Last EDR Contact: 04/11/05

LUST REG 3: Leaking Underground Storage Tank Database
Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147

Date of Government Version: 05/19/03	Date of Data Arrival at EDR: 05/19/03
Date Made Active at EDR: 06/02/03	Elapsed ASTM days: 14
Database Release Frequency: No Update Planned	Date of Last EDR Contact: 02/14/05

LUST REG 4: Underground Storage Tank Leak List
Source: California Regional Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Los Angeles, Ventura counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/07/04	Date of Data Arrival at EDR: 09/07/04
Date Made Active at EDR: 10/12/04	Elapsed ASTM days: 35
Database Release Frequency: No Update Planned	Date of Last EDR Contact: 03/29/05

LUST REG 5: Leaking Underground Storage Tank Database
Source: California Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-3291

Date of Government Version: 04/01/05	Date of Data Arrival at EDR: 04/28/05
Date Made Active at EDR: 05/06/05	Elapsed ASTM days: 8
Database Release Frequency: Quarterly	Date of Last EDR Contact: 04/19/05

LUST REG 6L: Leaking Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Lahontan Region (6)
Telephone: 916-542-5424
For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/03	Date of Data Arrival at EDR: 09/10/03
Date Made Active at EDR: 10/07/03	Elapsed ASTM days: 27
Database Release Frequency: No Update Planned	Date of Last EDR Contact: 04/12/05

LUST REG 6V: Leaking Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Victorville Branch Office (6)
Telephone: 760-346-7491

Date of Government Version: 06/07/05	Date of Data Arrival at EDR: 06/07/05
Date Made Active at EDR: 06/29/05	Elapsed ASTM days: 22
Database Release Frequency: No Update Planned	Date of Last EDR Contact: 04/15/05

LUST REG 7: Leaking Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Colorado River Basin Region (7)
Telephone: 760-346-7491

Date of Government Version: 02/26/04
Date Made Active at EDR: 03/24/04
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 02/26/04
Elapsed ASTM days: 27
Date of Last EDR Contact: 03/29/05

LUST REG 8: Leaking Underground Storage Tanks
Source: California Regional Water Quality Control Board Santa Ana Region (8)
Telephone: 951-782-4130
California Regional Water Quality Control Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board’s LUST database.

Date of Government Version: 02/14/05
Date Made Active at EDR: 03/28/05
Database Release Frequency: Varies
Date of Data Arrival at EDR: 02/15/05
Elapsed ASTM days: 41
Date of Last EDR Contact: 02/08/05

LUST REG 9: Leaking Underground Storage Tank Report
Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980
Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources Control Board’s LUST database.

Date of Government Version: 03/01/01
Date Made Active at EDR: 05/21/01
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 04/23/01
Elapsed ASTM days: 28
Date of Last EDR Contact: 04/19/05

CA BOND EXP. PLAN: Bond Expenditure Plan
Source: Department of Health Services
Telephone: 916-255-2118
Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.

Date of Government Version: 01/01/89
Date Made Active at EDR: 08/02/94
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 07/27/94
Elapsed ASTM days: 6
Date of Last EDR Contact: 05/31/94

CA UST:

UST: Active UST Facilities
Source: SWRCB
Contact: Los Angeles County Public Works, (626) 458-3511
Active UST facilities gathered from the local regulatory agencies

Date of Government Version: 04/12/05
Date Made Active at EDR: 05/06/05
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 04/13/05
Elapsed ASTM days: 23
Date of Last EDR Contact: 04/13/05

VCP: Voluntary Cleanup Program Properties
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC’s costs.

Date of Government Version: 05/04/05
Date Made Active at EDR: 07/07/05
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 06/01/05
Elapsed ASTM days: 36
Date of Last EDR Contact: 06/01/05

INDIAN UST: Underground Storage Tanks on Indian Land
Source: EPA Region 9
Telephone: 415-972-3368

Date of Government Version: 04/18/05
Date Made Active at EDR: 05/31/05
Database Release Frequency: Varies
Date of Data Arrival at EDR: 05/16/05
Elapsed ASTM days: 15
Date of Last EDR Contact: 05/16/05

INDIAN LUST: Leaking Underground Storage Tanks on Indian Land
Source: Environmental Protection Agency
Telephone: 415-972-3372
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 06/02/05
Date Made Active at EDR: 07/01/05
Database Release Frequency: Varies
Date of Data Arrival at EDR: 06/03/05
Elapsed ASTM days: 28
Date of Last EDR Contact: 05/25/05

INDIAN LUST: Leaking Underground Storage Tanks on Indian Land
Source: EPA Region 10
Telephone: 206-553-2857
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 06/14/05
Date Made Active at EDR: 07/15/05
Database Release Frequency: Varies
Date of Data Arrival at EDR: 06/14/05
Elapsed ASTM days: 31
Date of Last EDR Contact: 05/25/05

CA FID UST: Facility Inventory Database
Source: California Environmental Protection Agency
Telephone: 916-341-5851
The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board. Refer to local/county source for current data.

Date of Government Version: 10/31/94
Date Made Active at EDR: 09/29/95
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 09/05/95
Elapsed ASTM days: 24
Date of Last EDR Contact: 12/28/98

HIST UST: Hazardous Substance Storage Container Database
Source: State Water Resources Control Board
Telephone: 916-341-5851
The Hazardous Substance Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.

Date of Government Version: 10/15/90
Date Made Active at EDR: 02/12/91
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 01/25/91
Elapsed ASTM days: 18
Date of Last EDR Contact: 07/26/01

STATE OF CALIFORNIA ASTM SUPPLEMENTAL RECORDS

AST: Aboveground Petroleum Storage Tank Facilities
Source: State Water Resources Control Board
Telephone: 916-341-5712
Registered Aboveground Storage Tanks.

Date of Government Version: 02/01/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 02/24/05
Date of Next Scheduled EDR Contact: 05/02/05

CLEANERS: Cleaner Facilities
Source: Department of Toxic Substance Control
Telephone: 916-327-4498
A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaner's agents; linen supply; coin-operated laundries and cleaning; drycleaning plants, except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

Date of Government Version: 04/18/05
Database Release Frequency: Annually
Date of Last EDR Contact: 04/15/05
Date of Next Scheduled EDR Contact: 07/04/05

CA WDS: Waste Discharge System
Source: State Water Resources Control Board
Telephone: 916-341-5227
Sites which have been issued waste discharge requirements.

Date of Government Version: 03/21/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 03/22/05
Date of Next Scheduled EDR Contact: 06/20/05

DEED: Deed Restriction Listing
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Site Mitigation and Brownfields Reuse Program Facility Sites with Deed Restrictions & Hazardous Waste Management Program Facility Sites with Deed / Land Use Restriction. The DTSC Site Mitigation and Brownfields Reuse Program (SMBRP) list includes sites cleaned up under the program's oversight and generally does not include current or former hazardous waste facilities that required a hazardous waste facility permit. The list represents deed restrictions that are active. Some sites have multiple deed restrictions. The DTSC Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners.

Date of Government Version: 04/05/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

NFA: No Further Action Determination
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains properties at which DTSC has made a clear determination that the property does not pose a problem to the environment or to public health.

Date of Government Version: 05/04/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 06/01/05
Date of Next Scheduled EDR Contact: 08/29/05

EMI: Emissions Inventory Data
Source: California Air Resources Board
Telephone: 916-322-2990
Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/02
Database Release Frequency: Varies
Date of Last EDR Contact: 04/22/05
Date of Next Scheduled EDR Contact: 07/18/05

WIP: Well Investigation Program Case List
Source: Los Angeles Water Quality Control Board
Telephone: 213-576-6726
Well Investigation Program case in the San Gabriel and San Fernando Valley area.

Date of Government Version: 04/26/05
Database Release Frequency: Varies
Date of Last EDR Contact: 04/25/05
Date of Next Scheduled EDR Contact: 07/25/05

REF: Unconfirmed Properties Referred to Another Agency
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains properties where contamination has not been confirmed and which were determined as not requiring direct DTSC Site Mitigation Program action or oversight. Accordingly, these sites have been referred to another state or local regulatory agency.

Date of Government Version: 05/04/05 | Date of Last EDR Contact: 06/01/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 08/29/05

SCH: School Property Evaluation Program
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose.

Date of Government Version: 05/04/05 | Date of Last EDR Contact: 06/01/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 08/29/05

NFE: Properties Needing Further Evaluation
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains properties that are suspected of being contaminated. These are unconfirmed contaminated properties that need to be assessed using the PEA process. PEA in Progress indicates properties where DTSC is currently conducting a PEA. PEA Required indicates properties where DTSC has determined a PEA is required, but not currently underway.

Date of Government Version: 05/04/05 | Date of Last EDR Contact: 06/01/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 08/29/05

SLIC: Statewide SLIC Cases
Source: State Water Resources Control Board
Contact: Los Angeles County Public Works, (626) 458-3511
The Spills, Leaks, Investigations, and Cleanups (SLIC) listings includes unauthorized discharges from spills and leaks, other than from underground storage tanks or other regulated sites.

Date of Government Version: 04/12/05 | Date of Last EDR Contact: 04/13/05
Database Release Frequency: Varies | Date of Next Scheduled EDR Contact: 07/11/05

SLIC REG 1: Active Toxic Site Investigations
Source: California Regional Water Quality Control Board, North Coast Region (1)
Telephone: 707-576-2220

Date of Government Version: 04/03/03 | Date of Last EDR Contact: 02/23/05
Database Release Frequency: Semi-Annually | Date of Next Scheduled EDR Contact: 05/23/05

SLIC REG 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457
Any contaminated site that impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 09/30/04 | Date of Last EDR Contact: 04/11/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 07/11/05

SLIC REG 3: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147
Any contaminated site that impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 05/16/05 | Date of Last EDR Contact: 05/16/05
Database Release Frequency: Semi-Annually | Date of Next Scheduled EDR Contact: 08/15/05

SLIC REG 4: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Region Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Any contaminated site that impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 11/17/04
Database Release Frequency: Varies

Date of Last EDR Contact: 04/25/05
Date of Next Scheduled EDR Contact: 07/25/05

SLIC REG 5: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-3291
Unregulated sites that impact groundwater or have the potential to impact groundwater.

Date of Government Version: 04/01/05
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/05/05
Date of Next Scheduled EDR Contact: 07/04/05

SLIC REG 6V: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Regional Water Quality Control Board, Victorville Branch
Telephone: 619-241-6583

Date of Government Version: 05/24/05
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/18/05
Date of Next Scheduled EDR Contact: 07/04/05

SLIC REG 6L: SLIC Sites
Source: California Regional Water Quality Control Board, Lahontan Region
Telephone: 530-542-5574

Date of Government Version: 09/07/04
Database Release Frequency: No Update Planned

Date of Last EDR Contact: 03/07/05
Date of Next Scheduled EDR Contact: 06/06/05

SLIC REG 7: SLIC List
Source: California Regional Quality Control Board, Colorado River Basin Region
Telephone: 760-346-7491

Date of Government Version: 11/24/04
Database Release Frequency: Varies

Date of Last EDR Contact: 02/22/05
Date of Next Scheduled EDR Contact: 05/23/05

SLIC REG 8: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: California Region Water Quality Control Board Santa Ana Region (8)
Telephone: 951-782-3298

Date of Government Version: 07/01/04
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 04/06/05
Date of Next Scheduled EDR Contact: 07/04/05

SLIC REG 9: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980

Date of Government Version: 09/10/04
Database Release Frequency: Annually

Date of Last EDR Contact: 03/01/05
Date of Next Scheduled EDR Contact: 05/30/05

HAZNET: Facility and Manifest Data
Source: California Environmental Protection Agency
Telephone: 916-255-1136
Facility and Manifest Data. The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, and disposal method.

Date of Government Version: 12/31/02
Database Release Frequency: Annually

Date of Last EDR Contact: 02/17/05
Date of Next Scheduled EDR Contact: 05/09/05

LOCAL RECORDS

ALAMEDA COUNTY:

Underground Tanks
Source: Alameda County Environmental Health Services
Telephone: 510-567-6700

Date of Government Version: 02/15/05	Date of Last EDR Contact: 04/25/05
Database Release Frequency: Semi-Annually	Date of Next Scheduled EDR Contact: 07/25/05

Contaminated Sites
Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
A listing of contaminated sites overseen by the Toxic Release Program (oil and groundwater contamination from chemical releases and spills) and the Leaking Underground Storage Tank Program (soil and ground water contamination from leaking petroleum USTs).

Date of Government Version: 05/25/05	Date of Last EDR Contact: 04/25/05
Database Release Frequency: Semi-Annually	Date of Next Scheduled EDR Contact: 07/25/05

CONTRA COSTA COUNTY:

Site List
Source: Contra Costa Health Services Department
Telephone: 925-646-2286
List includes sites from the underground tank, hazardous waste generator and business plan/2185 programs.

Date of Government Version: 06/13/05	Date of Last EDR Contact: 06/13/05
Database Release Frequency: Semi-Annually	Date of Next Scheduled EDR Contact: 08/29/05

FRESNO COUNTY:

CUPA Resources List
Source: Dept. of Community Health
Telephone: 559-445-3271
Certified Unified Program Agency. CUPA's are responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials, operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 03/31/05	Date of Last EDR Contact: 01/19/05
Database Release Frequency: Semi-Annually	Date of Next Scheduled EDR Contact: 05/09/05

KERN COUNTY:

Underground Storage Tank Sites & Tank Listing
Source: Kern County Environment Health Services Department
Telephone: 661-862-8700
Kern County Sites and Tanks Listing.

Date of Government Version: 05/10/05	Date of Last EDR Contact: 05/02/05
Database Release Frequency: Quarterly	Date of Next Scheduled EDR Contact: 09/05/05

LOS ANGELES COUNTY:

List of Solid Waste Facilities
Source: La County Department of Public Works
Telephone: 818-458-5185

Date of Government Version: 02/01/05
Database Release Frequency: Varies
Date of Last EDR Contact: 02/18/05
Date of Next Scheduled EDR Contact: 05/16/05

City of El Segundo Underground Storage Tank
Source: City of El Segundo Fire Department
Telephone: 310-524-2236

Date of Government Version: 05/31/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 05/16/05
Date of Next Scheduled EDR Contact: 08/15/05

City of Long Beach Underground Storage Tank
Source: City of Long Beach Fire Department
Telephone: 562-570-2563

Date of Government Version: 03/28/03
Database Release Frequency: Annually
Date of Last EDR Contact: 02/23/05
Date of Next Scheduled EDR Contact: 05/23/05

City of Torrance Underground Storage Tank
Source: City of Torrance Fire Department
Telephone: 310-618-2973

Date of Government Version: 06/02/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 05/31/05
Date of Next Scheduled EDR Contact: 08/15/05

City of Los Angeles Landfills
Source: Engineering & Construction Division
Telephone: 213-473-7869

Date of Government Version: 03/01/05
Database Release Frequency: Varies
Date of Last EDR Contact: 03/18/05
Date of Next Scheduled EDR Contact: 06/13/05

HMS: Street Number List
Source: Department of Public Works
Telephone: 626-458-3517
Industrial Waste and Underground Storage Tank Sites.

Date of Government Version: 02/28/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 02/14/05
Date of Next Scheduled EDR Contact: 05/16/05

Site Mitigation List
Source: Community Health Services
Telephone: 323-890-7806
Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 05/25/05
Database Release Frequency: Annually
Date of Last EDR Contact: 05/16/05
Date of Next Scheduled EDR Contact: 08/15/05

San Gabriel Valley Areas of Concern
Source: EPA Region 9
Telephone: 415-972-3178
San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office.

Date of Government Version: 12/31/98
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 07/06/99
Date of Next Scheduled EDR Contact: N/A

MARIN COUNTY:

Underground Storage Tank Sites
Source: Public Works Department Waste Management
Telephone: 415-499-6647
Currently permitted USTs in Marin County.

Date of Government Version: 02/08/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 01/31/05
Date of Next Scheduled EDR Contact: 05/02/05

NAPA COUNTY:

Sites With Reported Contamination
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269

Date of Government Version: 03/29/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 03/28/05
Date of Next Scheduled EDR Contact: 06/27/05

Closed and Operating Underground Storage Tank Sites
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269

Date of Government Version: 03/29/05
Database Release Frequency: Annually
Date of Last EDR Contact: 03/28/05
Date of Next Scheduled EDR Contact: 06/27/05

ORANGE COUNTY:

List of Underground Storage Tank Cleanups
Source: Health Care Agency
Telephone: 714-834-3446
Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 06/01/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 06/10/05
Date of Next Scheduled EDR Contact: 09/05/05

List of Underground Storage Tank Facilities
Source: Health Care Agency
Telephone: 714-834-3446
Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 06/01/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 06/10/05
Date of Next Scheduled EDR Contact: 09/05/05

List of Industrial Site Cleanups
Source: Health Care Agency
Telephone: 714-834-3446
Petroleum and non-petroleum spills.

Date of Government Version: 06/01/05
Database Release Frequency: Annually
Date of Last EDR Contact: 06/10/05
Date of Next Scheduled EDR Contact: 09/05/05

PLACER COUNTY:

Master List of Facilities
Source: Placer County Health and Human Services
Telephone: 530-889-7312
List includes aboveground tanks, underground tanks and cleanup sites.

Date of Government Version: 04/05/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 03/21/05
Date of Next Scheduled EDR Contact: 06/20/05

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Source: Department of Public Health
Telephone: 951-358-5055
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 05/24/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 04/18/05
Date of Next Scheduled EDR Contact: 07/18/05

Underground Storage Tank Tank List
Source: Health Services Agency
Telephone: 951-358-5055

Date of Government Version: 05/24/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 04/18/05
Date of Next Scheduled EDR Contact: 07/18/05

SACRAMENTO COUNTY:

CS - Contaminated Sites
Source: Sacramento County Environmental Management
Telephone: 916-875-8406

Date of Government Version: 04/06/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 05/06/05
Date of Next Scheduled EDR Contact: 08/01/05

ML - Regulatory Compliance Master List
Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Any business that has hazardous materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Version: 03/29/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 05/06/05
Date of Next Scheduled EDR Contact: 08/01/05

SAN BERNARDINO COUNTY:

Hazardous Material Permits
Source: San Bernardino County Fire Department Hazardous Materials Division
Telephone: 909-387-3041
This listing includes underground storage tanks, medical waste handlers/generators, hazardous materials handlers, hazardous waste generators, and waste oil generators/handlers.

Date of Government Version: 03/25/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 03/07/05
Date of Next Scheduled EDR Contact: 06/06/05

SAN DIEGO COUNTY:

Solid Waste Facilities
Source: Department of Health Services
Telephone: 619-338-2209
San Diego County Solid Waste Facilities.

Date of Government Version: 08/01/00
Database Release Frequency: Varies
Date of Last EDR Contact: 02/22/05
Date of Next Scheduled EDR Contact: 05/23/05

Hazardous Materials Management Division Database
Source: Hazardous Materials Management Division
Telephone: 619-338-2268
The database includes: HE58 - This report contains the business name, site address, business phone number, establishment 'H' permit number, type of permit, and the business status. HE17 - In addition to providing the same information provided in the HE58 listing, HE17 provides inspection dates, violations received by the establishment, hazardous waste generated, the quantity, method of storage, treatment/disposal of waste and the hauler, and information on underground storage tanks. Unauthorized Release List - Includes a summary of environmental contamination cases in San Diego County (underground tank cases, non-tank cases, groundwater contamination, and soil contamination are included.)

Date of Government Version: 05/16/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 04/22/05
Date of Next Scheduled EDR Contact: 07/04/05

SAN FRANCISCO COUNTY:

Local Oversite Facilities
Source: Department Of Public Health San Francisco County
Telephone: 415-252-3920

Date of Government Version: 06/07/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 06/05/05
Date of Next Scheduled EDR Contact: 09/05/05

Underground Storage Tank Information
Source: Department of Public Health
Telephone: 415-252-3920

Date of Government Version: 06/07/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 06/05/05
Date of Next Scheduled EDR Contact: 09/05/05

SAN MATEO COUNTY:

Fuel Leak List
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921

Date of Government Version: 05/05/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 04/11/05
Date of Next Scheduled EDR Contact: 07/11/05

Business Inventory
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
List includes Hazardous Materials Business Plan, hazardous waste generators, and underground storage tanks.

Date of Government Version: 05/12/05
Database Release Frequency: Annually
Date of Last EDR Contact: 04/11/05
Date of Next Scheduled EDR Contact: 07/11/05

SANTA CLARA COUNTY:

Fuel Leak Site Activity Report
Source: Santa Clara Valley Water District
Telephone: 408-265-2600

Date of Government Version: 03/29/05 | Date of Last EDR Contact: 03/29/05
Database Release Frequency: Semi-Annually | Date of Next Scheduled EDR Contact: 06/27/05

Hazardous Material Facilities
Source: City of San Jose Fire Department
Telephone: 408-277-4659

Date of Government Version: 01/14/05 | Date of Last EDR Contact: 03/07/05
Database Release Frequency: Annually | Date of Next Scheduled EDR Contact: 06/06/05

SOLANO COUNTY:

Leaking Underground Storage Tanks
Source: Solano County Department of Environmental Management
Telephone: 707-784-6770

Date of Government Version: 04/18/05 | Date of Last EDR Contact: 04/18/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 06/13/05

Underground Storage Tanks
Source: Solano County Department of Environmental Management
Telephone: 707-784-6770

Date of Government Version: 04/18/05 | Date of Last EDR Contact: 04/18/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 06/13/05

SONOMA COUNTY:

Leaking Underground Storage Tank Sites
Source: Department of Health Services
Telephone: 707-565-6565

Date of Government Version: 04/25/05 | Date of Last EDR Contact: 04/25/05
Database Release Frequency: Quarterly | Date of Next Scheduled EDR Contact: 07/25/05

SUTTER COUNTY:

Underground Storage Tanks
Source: Sutter County Department of Agriculture
Telephone: 530-822-7500

Date of Government Version: 01/29/04 | Date of Last EDR Contact: 04/18/05
Database Release Frequency: Semi-Annually | Date of Next Scheduled EDR Contact: 07/04/05

VENTURA COUNTY:

Inventory of Illegal Abandoned and Inactive Sites
Source: Environmental Health Division
Telephone: 805-654-2813
Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Government Version: 08/01/04 | Date of Last EDR Contact: 02/23/05
Database Release Frequency: Annually | Date of Next Scheduled EDR Contact: 05/23/05

Listing of Underground Tank Cleanup Sites
Source: Environmental Health Division
Telephone: 805-654-2813
Ventura County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 03/01/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 03/18/05
Date of Next Scheduled EDR Contact: 06/13/05

Underground Tank Closed Sites List
Source: Environmental Health Division
Telephone: 805-654-2813
Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Government Version: 03/30/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 04/15/05
Date of Next Scheduled EDR Contact: 07/11/05

Business Plan, Hazardous Waste Producers, and Operating Underground Tanks
Source: Ventura County Environmental Health Division
Telephone: 805-654-2813
The BWT list indicates by site address whether the Environmental Health Division has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) information.

Date of Government Version: 03/01/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 03/18/05
Date of Next Scheduled EDR Contact: 06/13/05

YOLO COUNTY:

Underground Storage Tank Comprehensive Facility Report
Source: Yolo County Department of Health
Telephone: 530-666-8646

Date of Government Version: 04/19/05
Database Release Frequency: Annually
Date of Last EDR Contact: 04/18/05
Date of Next Scheduled EDR Contact: 07/18/05

EDR PROPRIETARY HISTORICAL DATABASES

Former Manufactured Gas (Coal Gas) Sites: The existence and location of Coal Gas sites is provided exclusively to EDR by Real Property Scan, Inc. ©Copyright 1993 Real Property Scan, Inc. For a technical description of the types of hazards which may be found at such sites, contact your EDR customer service representative.

Disclaimer Provided by Real Property Scan, Inc.

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BROWNFIELDS DATABASES

VCP: Voluntary Cleanup Program Properties
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 05/04/05
Database Release Frequency: Quarterly
Date of Last EDR Contact: 06/01/05
Date of Next Scheduled EDR Contact: 08/29/05

US BROWNFIELDS: A Listing of Brownfields Sites
Source: Environmental Protection Agency
Telephone: 202-566-2777
Included in the listing are brownfields properties addresses by Cooperative Agreement Recipients and brownfields properties addressed by Targeted Brownfields Assessments. Targeted Brownfields Assessments-EPA's Targeted Brownfields Assessments (TBA) program is designed to help states, tribes, and municipalities--especially those without EPA Brownfields Assessment Demonstration Pilots--minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides funding and/or technical assistance for environmental assessments at brownfields sites throughout the country. Targeted Brownfields Assessments supplement and work with other efforts under EPA's Brownfields Initiative to promote cleanup and redevelopment of brownfields. Cooperative Agreement Recipients-States, political subdivisions, territories, and Indian tribes become Brownfields Cleanup Revolving Loan Fund (BCRLF) cooperative agreement recipients when they enter into BCRLF cooperative agreements with the U.S. EPA. EPA selects BCRLF cooperative agreement recipients based on a proposal and application process. BCRLF cooperative agreement recipients must use EPA funds provided through BCRLF cooperative agreement for specified brownfields-related cleanup activities.

Date of Government Version: 01/10/05
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 03/14/05
Date of Next Scheduled EDR Contact: 06/13/05

US INST CONTROL: Sites with Institutional Controls
Source: Environmental Protection Agency
Telephone: 703-603-8867
A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 01/10/05
Database Release Frequency: Varies
Date of Last EDR Contact: 04/04/05
Date of Next Scheduled EDR Contact: 07/04/05

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

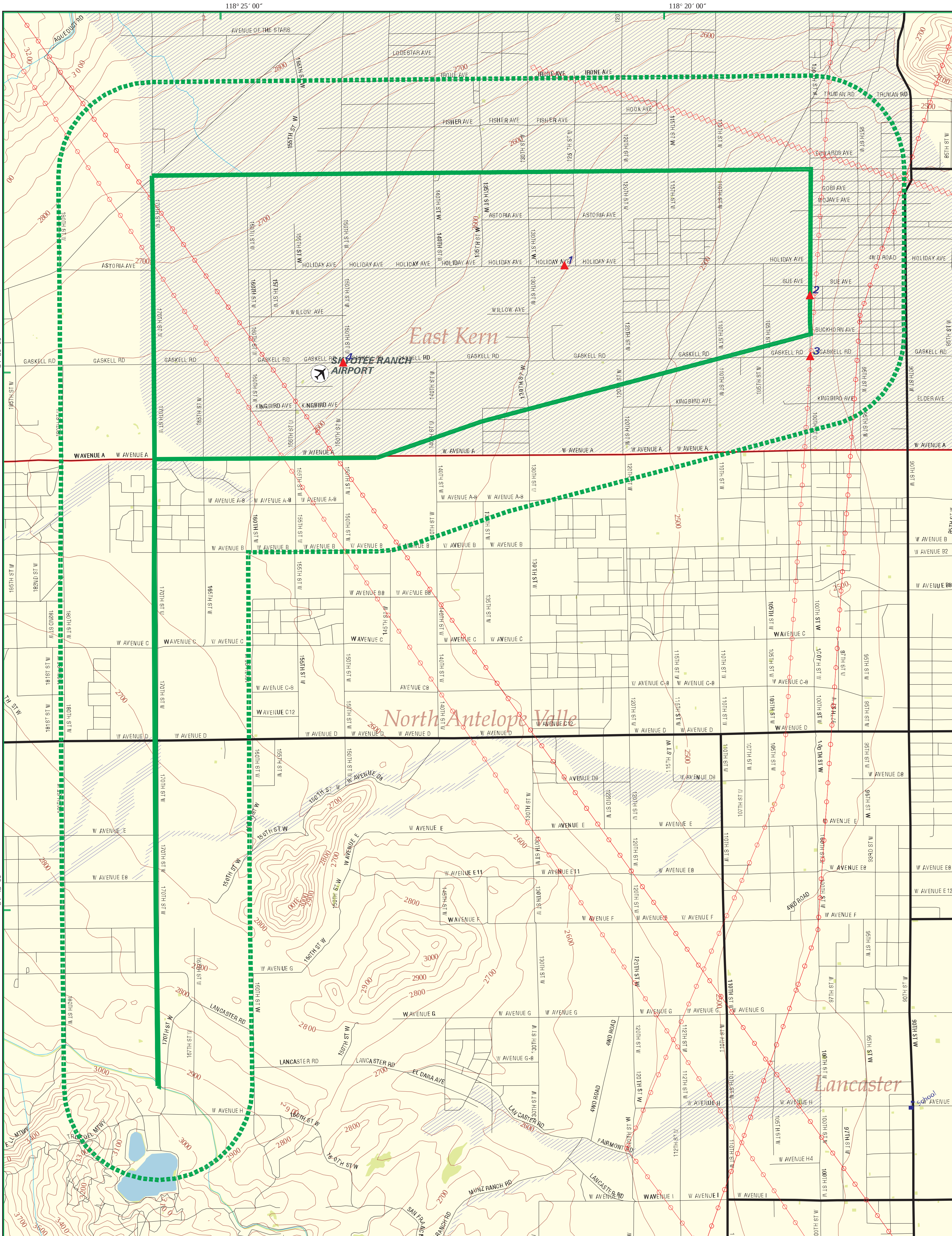
Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 916-657-4041

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 from the U.S. Fish and Wildlife Service.

STREET AND ADDRESS INFORMATION

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.



EDR DataMap™ – Area Study

EDR Environmental Data Resources Inc

Antelope Valley Water Bank Project

LA County, CA

- Listed Sites
- Earthquake Epicenters (Richter 5 or greater)
- Search Boundary
- Roads
- Major Roads
- Waterways
- Railroads
- Contour Lines
- Pipelines
- Powerlines
- Fault Lines
- Water
- Superfund Sites
- Federal DOD Sites
- Indian Reservations BIA
- 100-Yr Flood Zones
- Wetlands

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Scale in Miles

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